

**CHAPTER 5**  
**ENGINEERING**  
**(R645-301-500)**

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### CHAPTER 5:

### ENGINEERING

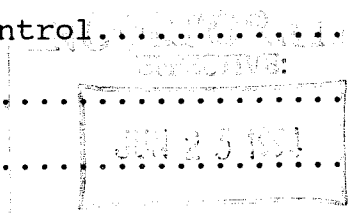
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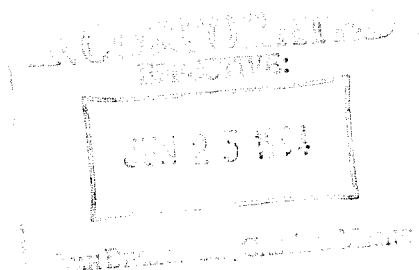
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## **ENGINEERING (R645-301-500)**

### **5.10 INTRODUCTION:**

This chapter will present the Operation Plan, Reclamation Plan, Design criteria, and Performance standards which will affect the mining operations of the Crandall Canyon Mine. The facilities and structures have been and/or will be designed in such a way to minimize the potential impacts of operations at the mine site.

### **5.11 General Requirements:**

The methods, calculations, maps, plans, and cross-sections attendant to the operations of the Crandall Canyon Mine Facilities and subsequent reclamation operations are presented in the following sections. These designs are required to comply with the design within the R645-301-500 regulations.

### **5.12 Certification:**

All maps, cross-sections, designs, and plans, as required will be prepared by, or under the direction of, and certified by a qualified, professional engineer or land surveyor.

### **5.13 Compliance with MSHA Regulations and MSHA Approvals:**

As required by MSHA, the surface of the mine site is inspected on a quarterly basis, as mandated by law, and on spot inspections as deemed necessary by the governing agency. All mine openings are inspected on a quarterly basis and/or more often if deemed necessary by MSHA.

Genwal Coal Company will comply with the requirements of both DOGM and MSHA regarding these facilities.

### **5.14 Inspections**

All engineering inspections, except those described under R645-301-514.330, will be conducted by a qualified registered professional engineer or other qualified professional specialist under the direction of the professional engineer.

The existing sedimentation pond will be inspected by a professional engineer or a qualified person under the supervision of a professional engineer, on an annual basis. The inspection report, see Figure 5-1, will be certified by the professional engineer and be provided to the Division as part of the annual report.

Quarterly inspections will be performed by a qualified person for appearance of structural weakness and other hazardous conditions, as specified in R645-301-330.

### CERTIFICATION REPORT

On \_\_\_\_\_, 199\_, an inspection of Genwal Coal Company's sedimentation pond number 1 revealed the following:

- A. The pond has been constructed and maintained in accordance with the approved plan.
- B. The pond's dam appeared sound with no signs of instability or hazardous condition.
- C. The water evaluation was \_\_\_\_\_ feet. The water depth was \_\_\_\_\_ feet.
- D. The existing storage capacity is \_\_\_\_\_ acre-feet which is greater than/less than .95 acre-feet required by the Mining and Reclamation plan.
- E. The pond is inspected quarterly for structural problems.
- F. Comments and Remarks \_\_\_\_\_

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I have performed the above inspection on this pond and do hereby certify it to be a true and accurate representation of the pond at this time.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Figure 5-1



# SEDIMENTATION POND INSPECTION REPORT

<b>DATE</b>	<b>TIME</b>	<b>DECANT LEVEL</b>	<b>DISCHARGE</b>	<b>CONTROL DEVICE</b>	<b>DIKE INSPECTED BY</b>

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page, possibly from a spiral-bound notebook as there's a slight shadow on the left edge. The background is plain white.

Figure 5-2

Figure 5-2 will be used to record information from each inspection. This report will be located at the mine site.

#### 5.15 Reporting and Emergency Procedures:

##### 5.15.10 Reporting a slide

At any time a slide occurs which may have a potential adverse effect on public, property, health, safety, or the environment, Genwal will notify the Division promptly of the problem and of any remedial measures planned to correct the problem. If any examination or inspection of the sedimentation pond discloses that a potential hazard exists, the Division will be notified by the fastest available means, of the hazards and of the remedial measures to correct such hazards.

The applicant will comply with any remedial measures requested by the Division and agreed upon by the operator.

##### 5.15.20 Impoundment hazards

If any examination or inspection discloses that a potential hazard exists, Genwal will promptly inform the Division of the finding and of the emergency procedures formulated for public protection and remedial action.

If adequate procedures cannot be formulated or implemented, the Division will be notified immediately.

##### 5.15.30 Temporary cessation

In the event of a temporary cessation, as defined by the Division, of the Crandall Canyon Mine operation, Genwal will notify the Division as soon as possible and will effectively support and maintain all surface access openings to the underground operations, and secure surface facilities in areas in which there would be no current operations, but operations would resume under an approved permit.

Before temporary cessation of coal mining and reclamation operations for a period of 30 days or more, or as soon as it is known that a temporary cessation will extend beyond 30 days, Genwal will submit to the Division a notice of intention to cease or abandon operations. This notice will be as required by R645-301-515.321.

#### 5.20 OPERATION PLAN:

This section presents the operations plan for the Crandall Canyon Mine.

## **5.21 GENERAL:**

This section presents a description of the plan for operation of the permit area, including descriptions of previously mined and presently mined areas, surface and subsurface facilities, land owner and right-of-way maps, permit area maps, and other feature maps which apply.

### **5.21.11 Previously Mined and Presently Mined Areas**

Plate 5-1, 5-2, 5-2A, and 5-2B show the location and extent of past and present underground mining operations.

### **5.21.12 Existing Surface and Subsurface Facilities and Features**

The location of surface and subsurface man-made features within, passing through, or passing over the proposed permit area are combined on plate 5-3, Plate 7-5 and Plate 7-5A. Other detail plans are as shown on plate 5-4 (In Mine Sump), Plate 2-2 (Top Soil Storage Piles), Plate 5-6 (Truck Loadout Facility), Plate 5-7 (Rock Dust Silo), 5-8 (Electrical Substation), and Plates 7-4A and 7-6A (Sedimentation Pond Details and Cross-Sections).

The design and details for the USFS road within the permit area are shown on Plates 5-19, sheet 5 of 9 (Concrete Turnaround), sheet 6 of 9 (Layout of the USFS road), sheet 7 of 9 (Gabion Wall), sheet 8 of 9 (Rock Wall Details), and sheet 9 (Upper Parking Area).

### **5.21.13 Landowners and Right-of-Entry and Public Interest Maps**

The owners of record of those lands both surface and subsurface, included in or contiguous to the permit area are shown on Plate 1-1. The permit area on which the applicant has the legal right to enter is shown on Plate 5-2.

Appendix 1-1, 1-2, 1-3, 1-4, and 1-5 shows the legal right of the applicant to enter and begin coal mining and reclamation operations, and the measures to be used to ensure that the interests of the public and landowners affected are protected under R645-103-234.

### **5.21.14 Mine Maps and Permit Area Maps**

Plates 5-2, 5-2A, and 5-2B show the boundaries of all areas affected by mining operations. Plate 1-1 shows an additional proposed permit area that is at this time being evaluated under a Lease by Application by the United States Forest Service. Plate 5-3 shows the surface area within the permit that will be affected during the life of the mining operation. Underground workings and location and extent of area of potential subsidence is included on

Plate 5-2.

#### **5.21.15 Land Surface Configuration Maps**

Topographic maps used by Genwal to clearly indicate surface contours to adequately represent the existing land surface configuration within the permit area is represented on Plate 5-3.

#### **5.21.16 Maps and Cross-sections of the Features and Proposed Features**

Maps produced by Genwal will show the facilities, disturbed area, disturbed area boundary, (Plate 5-3), explosive storage (there is no explosive storage on the surface), and point source discharges (Plate 7-5). These maps are located within this application.

#### **5.21.17 Transportation Facilities Maps**

This application describes each road and conveyor system to be constructed and used by the applicant as required by R645-301-527.

Maps supporting this section include Plates 5-3, 5-6, 5-10, 5-19, 7-5, 7-5A, 7-5B and 7-5C.

#### **5.21.18 Support Facilities**

Drawings showing support facilities are located on Plates 5-3, 5-6, 5-7, 5-8, 5-18, 7-5, 7-5A, 7-5B, and 7-5C.

#### **5.21.20 Signs and Markers**

Signs and Markers will be posted, maintained, and removed by the operator; will be of uniform design that can be easily seen and read, be made of durable material, and conform to local laws and regulations, and be maintained during all activities to which they pertain. Identification signs will be placed, maintained, and marked in accordance with R645-301-243.

#### **5.21.24 Mine and Permit Identification Signs**

Mine and permit identification signs will be displayed in accordance with R645-301-521.240 through R645-301-521.244.

#### **5.21.25 Perimeter Markers**

The perimeter of all areas affected by surface operations or facilities will be clearly marked.

#### **5.21.26 Buffer Zone Markers**

Signs will be erected for buffer Zones as required by R645-

301-731.600 and will be clearly marked.

#### 5.21.27 Topsoil Markers

Markers will be erected to mark where topsoil or other vegetation-supporting material is physically segregated and stockpiled as required under R645-301-234.

#### 5.22 Coal Recovery

The Bureau of Land Management (BLM) and the Utah State Division of Natural Resources govern the conservation and royalty payments of the coal located within the Applicant's proposed permit boundary. Mining plans must be approved by the BLM and UDOGM. before mining can occur within the new area. This prior approval ensures the diligent development and extraction of all minable coal.

The lower Blackhawk Formation of the Wasatch Plateau is known to contain two minable seams in this general area. These two seams are locally referred to as the Hiawatha and Blind Canyon (lower and upper seams respectively) seams. Originally two seams were thought to exist in the mine plan area, however a drilling program that began in March of 1985, and has since concluded, has revealed that the upper seam is not of minable thickness in the Lease Area. Future drilling may be done to determine the feasibility of mining the upper seam, if the horizontal extent and mining conditions make mining the upper seam economically feasible. If the economics of mining the upper seam are present, plans will be developed and submitted to the proper agencies for approval.

Neither the Blind Canyon nor the Bear Canyon seams are of minable thickness in the mine permit area and no portals, shafts, or slopes are anticipated. The BLM has determined the upper seam is not minable and during 1985, approval was given by both the BLM and the Division to commence pillaring of the lower seam.

Genwal Coal Company will mine from rock to rock in areas where coal is less than 8' thick, however in order to protect the environment from unsightly waste rock piles, all attempts will be to leave the rock in place. In areas greater than 8', a coal top or bottom will be left for safety reasons and attempted to be mined on the retreat.

Although maximum recovery is an important design criteria, other considerations must be looked at in the final analysis in the extraction of coal. These factors consider the insurance of protection of personnel and the environment. Coal reserves will not be recovered in the following areas:

1. Areas where the coal thickness is less than 5'. Mining at this height or below is not feasible under current

economic conditions.

2. Solid coal barriers will be left to protect main entries from mined out panels. This will help to guarantee stability of the main entries for the life of the mine.
3. Solid coal barriers will be left between particular panels for roof and floor protection.
4. When extreme hazardous conditions exist, and personal safety is compromised, coal extraction could then be terminated in that area of concern.
5. Coal will only partially be recovered in areas under existing perennial streams within the specified angle of draw approved by the Division.

#### 5.23 Mining Methods

Mining methods used or to be used consist of Room and Pillar mining. Projected mine development is depicted on Plates 5-2, 5-2A, and 5-2B.

The following geotechnical description is based upon room and pillar mining using either conventional or continuous mining equipment followed by pillar extraction in the Hiawatha Seam. The mining plan has been developed to maximize the coal recovered in an economical manner.

Retreat mining will be done in accordance with the approved MSHA roof control plan. All pillars in the mine, with the exception of barrier pillars or other pillars needed to protect the outcrop, will be fully extracted, however safety or economic reasons may dictate some pillars or partial pillars may remain in place. Pillars used to protect mains, submains, and fire breaks will be left until final retreat or when they serve no useful purpose.

#### Mining Operation

The mine was installed in an area of old works in the Hiawatha Seam. Coal was produced from this operation during the period of 1940 through 1955 and was sold locally for domestic use. Certain sections of the mine were reopened so that water sumps, ventilation, and coal haulage facilities were reestablished. Plate 5-2 illustrates: 1) the manner in which the old workings were modified and repaired in order to bring them into compliance with current regulations and 2) the overall mining plans of Genwal Coal Company.

Where necessary, the old workings were widened to accommodate a 48 inch coal haulage conveyor. Proper roof supports were placed in areas of questionable roof control problems were encountered.

The mining operation will access only the Hiawatha Seam by drifting into the seam from the coal outcrop. Completed drilling indicates no areas of minable coal in the upper seams. The portal area for the Hiawatha seam will have three entries: one intake ventilation entry, which will also serve as a haulage route, one neutral coal haulage conveyor entry, and one return airway. The portal access area for the mine will have the necessary surface support items such as a ventilation fan, conveyor belt drive, power, etc.

### Mining History

The Hiawatha Seam is the only seam to be mined on the leases with an average thickness of six feet. The coal heights encountered range from 5.5 to 6.5 feet except in the sandstone roll area which is approximately 4.5' as shown on Plate 6-2. The coal within the permit area is high volatile bituminous type. The seam will be entered into at an elevation of 7895 feet. Elevations within the mine range from 7892.1 to 7909.3 feet. The old works in the Hiawatha seam are accessible and it appears that the immediate roof is a competent sandstone, ranging from laminated to massive, interrupted by an occasional shale-siltstone lens varying in thickness from approximately six inches to two feet. Roof falls in the old works are confined to the siltstone lenses and where observed are usually at intersections of rooms and entries. Falls are generally over the width of the opening extending rib to rib and less than 2' thick.

The following description of the general mining sequence will apply to the Hiawatha seam. No development is anticipated in any of the upper seams as they are too thin to be economically recoverable. The projected mining plan for the Hiawatha seam is illustrated on Plates 5-2 and 5-2C as presented below:

1. Portal area excavated.
2. Actual portals established.
3. Permanent fan installation for exhaust ventilation.
4. North Mains developed.
5. North Mains completed to intersection with planned 1ST West.
6. First West developed.
7. First West completed
8. Development of 1st South Panel of 1st West.
9. Pillar recovery of 1st South panel.
10. 1st South panel sealed.
11. Development of 2nd South panel.
12. Pillar recovery of 2nd South panel.
13. 2nd South panel sealed.
14. Development of North Mains into Tract II.
15. Development of 2nd West.
16. Pillar recovery of barrier pillars and 1st West.

17. Development of 3rd West.
18. Pillar recovery of 2nd West.
19. Development of 4th West.
20. Begin development of East Mains.
21. Develop North Mains into lease u 054762.
22. Develop Main West.
23. Pillar recovery of 3rd and 4th West.
24. Development of 1st East Mains to Eastern lease boundary.
25. Development of 1E1N along eastern boundary to northern lease boundary.
26. Pillar recovery of 1E1N.
27. Development of 1E2N.
28. Pillar recovery of 1E2N.
29. Development of 1E3N.
30. Pillar recovery of 1E3N (continued in sequence).
31. Recover East Mains.
32. Develop Main West To the State leases ML-21568 and ML-21569.

Development to the State Leases was accomplished by an agreement and purchase of a 4670.5' long x 1040' wide right-of-way from the BLM. Six entries were developed and appears on Plate 5-2 and 5-11.

Mining has commenced in lease ML-21569 as shown Plate 5-2A. Main West has reached the west boundary of the lease within 100' of the western edge. 1st North, a four entry system with 100' X 55' pillars, has been developed off Main West and runs up the eastern side to the northern boundary of the lease, while 1st Right, a five entry system with 100' X 60' pillars, has been developed up the western side to the northern boundary of the lease. 1st North is used as mains for development of pillar sections 1st Left through 9th Left while 1st Right is used as the bleeder for these pillar sections. Typical entry width is 20' wide.

1st Left, 2nd Left, and 3rd Left have thus far been developed and pillared. 4th Left through 9th Left will be developed and retreat mined in that order. 1st North, 1st Right, and Main West will not be retreat mined. These three sections will be left intact to be used as mains in future mining.

Lease ML-21568 is to be accessed by five entries which extend southward from the Main West Section along the eastern edge of the lease as shown on Plate 5-2B. Five entries, running east-west, extend to the western edge of lease ML-21568, and access 12 panels. In this lease retreat mining will commence with panels 1st Right, progress to the north, and end with the 12th Right panel.

#### Underground Equipment

Typical mining equipment used in this area will be employed to mine coal in this permit area. Two continuous miners will be employed to mine coal in this lease area. The following is a list



of equipment, or equivalent, that will be utilized underground and on the surface as required:

- Joy Miners
- Roof Bolters
- Feeder Breakers
- Battery powered scoops and face haulage
- Various Electrical Equipment
- Long Airdox continuous haulage system

#### Geotechnical:

Within the Utah State Leases ML-21568 and ML-21569, conclusions from present drill hole information (see Appendix 6-5) and from BLM data bases excludes the possibility of multiple minable seams being present.

The coal seam to be mined on the Genwal leases occur in the lower part of the Blackhawk Formation. The Formation is comprised of approximately 1000 feet of gray carbonaceous shales, siltstones, coals, and interbedded sandstones of late Cretaceous age. The Star Point sandstone, a massive cliff forming 700 to 900 foot thick sandstone unit, underlies the Blackhawk Formation and its top serves as a useful lithologic landmark in the area.

An isopach map of the Hiawatha Coal seam overburden appears in Figure 5-6. Overburden thickness above the area to be mined in Lease ML-21568 ranges from 750' to 2200'. The area to be mined in Lease ML-21569 has overburden thicknesses of 600' to 2100'. Coal pillar height is 8 feet in Lease ML-21568, and ranges from 5' to 10' in Lease 21569. An average uniaxial compressive strength of 1821 psi (geomechanical tests, Appendix 5-1) were used in the pillar safety factor calculations.

The formations in the area dip gently 1 to 3 degrees westward off the west flank of the San Rafael Swell, however the mine is relatively flat experiencing a 0 to 2 degree dip locally. The regional structure is broken by several north-south trending, high angle normal faults which offset the rocks from less than 1 foot to 250 feet or more.

#### Pillar Design

Methods used to evaluate safety factors of the pillar design are discussed in Appendix 5-2. A minimum acceptable safety factor for main entries and rooms are 1.5 and 1.3 respectively. Calculations of pillar safety factors are found in Appendix 5-3. Lease ML-21568 pillar safety factors for rooms and main entries range from 1.37 to 1.96 and 1.39 to 2.45 respectively. Pillar safety factors for rooms and main entryways in Lease ML-21569 range

from 1.47 to 2.45 and 1.78 to 4.37 respectively. As the ratio of pillar length to height approaches 12, pillars are regarded as being able to bear and load. The pillar recovery plan currently approved by MSHA, DOGM, and the USFS was designed by Genwal employees with the aid of MSHA Technical Support in Denver and information in a technical report "Coal Pillar Sizing, Genwal Mine" prepared by Mr. Dan W. Guy of Blackhawk Engineering Co. on 10-1-84.

The purpose of the Blackhawk Engineering Report was to evaluate the use of 60' x 60' centers on the entries and rooms during panel development. The major assumptions used in the analysis were an average coal compressive strength of 1400 psi, a mining height of six feet, an entry width of 20 feet, an overburden pressure gradient of one psi per foot of depth and a minimum acceptable safety factor of 1.3 in the panel areas. The conclusions of this report states that the remaining 40 foot square pillars will have a safety factor of 1.39 or greater in areas with less than 1000' of cover which is acceptable for short term entries. A copy of this report can be found as Appendix 5-2. If a less conservative uniaxial compressive strength is used in the Obert Formula, as recommended by Seegmiller International, of 2200 psi the safety factor becomes 2.19 at 1000 feet of cover for 40' x 40' coal pillars. The 40 foot square pillars are designed in areas where the overburden never reaches a value greater than 700 feet, refer to Plate 6-2. Recalculation of the Obert Formula using uniaxial compressive strength of 2200 psi, 700 feet of overburden, and a 40 foot square pillar results in a safety factor of 3.12. The greatest coal height recorded during the development of the 1st South panel was 6.3 feet as shown on Plate 5-2C, in good agreement with the six foot coal height assumption used in all calculations. A 3.12 factor of safety for the 40 foot square pillars is acceptable rather than using the recommended value of four in the SME Engineering Handbook, page 13-104, for the following reason:

1. The SME engineering Handbook on pages 13-104 states that the ratio of length of pillar to average coal thickness approaches 12, the pillars are regarded as being able to bear any load. The length of pillar to average coal thickness ratio is 6.7. The value of 6.7 is substantial in comparison to the limit of 12 justifying an allowance for safety factor reduction. This was proven as this area was mined completely.

The northern half of lease SL 062648 panel was developed using 60' square pillars on 80 foot centers. The coal height is expected to remain at six feet with a maximum of 1450 feet of overburden to be experienced in the northwest corner, refer to Plate 6-2. Assuming a uniaxial compressive strength of 2200 psi and 20 foot entry development, the resulting factor of safety is 2.54 using the Obert Formula. The ratio of pillar length to pillar height is now ten, very close to the value of 12 recommended in the SME Mining Engineering Handbook as described above. An allowance for safety

factor reduction from the recommended 4 to 2.54 is justifiable for entry development with expected life less than one year for pillars with a substantial width to height ratio.

The overburden reaches a maximum thickness of approximately 1700 feet on Coal Lease U-054762 in the SE1/4, SE1/4, S31, T15S R7Em SLBM. Assuming a uniaxial compressive strength of 2200 psi, an appropriate coal height, 6 feet in this instance, 20 foot wide entry development, and 70 foot square pillars, the resulting Ratio of Pillar length to average coal thickness is 11.7 within this area, very close to the value of 12, recommended in the SME Mining Engineering Handbook as described above. The resulting factor of safety of 2.62, the existence of a 500 foot barrier pillar adjacent to the Mains within this area, and a substantial ratio of width to height provide satisfactory evidence that the pillars, both in development and in barriers, will provide long term entry support.

During secondary mining, half of the coal pillar was removed by taking four cuts across the side or across the front of the pillar. A pillaring plan for the removal of the left and right side of adjacent pillars was also used for greater coal recovery. No bolting was required after the panels had been developed and all additional roof support was provided by timbers spaced on five foot centers.

Overburden above the right-of-way U-66838 ranges from 1300 feet to 1700 feet, with a weighted average of about 1500 feet. Pillars within a six entry system are 60 feet wide and 140 feet long. Pillar center spacing is 80 feet and 160 feet. Pillar height grades from 5 feet at the eastern end to a maximum of about 9.6 feet at the western end, resulting in a weighted average height of about 7.16 feet.

Calculations of right-of-way pillar safety factors are found in Appendix 5-4. Right-of-way safety factors range from 1.85 to 3.03, well above the minimum acceptable value of 1.5. As the ratio of pillar length to height approaches 12, pillars are regarded as being able to bear any load. The pillar length to height ratio in the right-of-way ranges from 14.6 to 28, well above the value of 12; thus the right-of-way pillars should be able to bear any load.

In Lease ML-21568, pillar safety factors for rooms and main entries range from 1.37 to 1.96 and 1.39 to 2.45 respectively. Pillar safety factors for rooms and main entryways in Lease ML-21569 range from 1.47 to 2.45 and 1.78 to 4.37 respectively. As the ratio of pillar length to height approaches 12, pillars are regarded as being able to bear any load. The pillar length to height ratio in Lease ML-21568 is 17.5, and in Lease ML-21569 ranges from 17.5 to 23.3, all well above the value of 12; thus the pillars should be able to bear any load.

Roof span design is derived from the accepted practice in the

Wasatch Plateau of 20 foot entry and crosscut widths. Previous experience in the Crandall Canyon and nearby mines have supported this roof span width. Roof span in Leases ML-21568 and ML-21569 is 20 feet in entries and crosscuts. Roof support bolting will consist of a minimum 4 foot resin pins with 5 foot centers during development of each section with the exception of the right-of-way UTU-66838. This lease has roof support consisting of a minimum of 4 foot resin pins with 4 foot centers.

The floor of the coal seam grades from a clayey shale less than one foot thick to laminated sandstone, as observed in the old works.

#### Barrier Perimeters

The barrier pillar around the perimeter of the property has been designed according to Utah mining regulations which is based upon the following formula:

$$\text{Width} = 2 * \text{coal thickness of coal to be extracted in feet} + 5 * \text{overburden thickness in feet} / 100 + 10'$$

The perimeter pillar is shown on Plate 5-2C. The following selected points were used to establish the pillar size at various locations:

	<u>Location</u>	<u>Overburden</u>	<u>Barrier</u>	<u>Coal Height</u>
1.	Southwest Corner Tract 1	550 feet	50 feet	6
2.	Northwest Corner Tract 2	1550 feet	100 feet	6
3.	Western Boundary (Max.)	1700 feet	108 feet	6
4.	Northwest Corner U-054762	1500 feet	97 feet	6

#### Annual Production of Coal

Mining recovery of the coal in Tract 1 and 2 was greater than 50% of the total inplace coal. Lease SL-062648 contained approximately 860,000 tons of recoverable coal. No minable reserves remain in Lease SL-062648. Lease U-54762 contained approximately 5.2 million tons of inplace coal of which approximately .9 million was recoverable. Approximately .25 million tons will be left inplace for final retreat mining.

Mining recovery of the right-of-way, UTU-66838 was 269,000 tons (development). No retreat mining will be done within this right-of-way, leaving access to the State Leases and other potential coal reserves to the north, south, and west.

Annual coal production in 1991 was 877,500 raw tons. Projected production for 1992 is 1,000,000 raw tons. During 1993 and through the end of the century, total production tonnage is forecasted to be 1,500,000 raw tons annually. This production will be achieved by the use of continuous mining machines, continuous haulage equipment, and/or diesel driven coal haulers.

#### **Access To Future Reserves**

Access to future reserves will be maintained by the North Mains entries, Main West entries, 1st North, and 1st Right sections. North Mains will maintain access to the mine as well as Main West. Main West will also maintain access to the west and to the South. 1st North will maintain access to the north and east, while 1st Right will maintain access to the north and west.

#### **Projected Mining by Future Permit for the Planned Life of the Mine**

All coal around the permit area has the potential for future mining by the Crandall Canyon Mine. Provisions have been made to access future reserves, however, we cannot formulate a logical mining plan at this time without knowing the sequence of the Federal Coal Leasing Program, refer to Plate 1-1.

#### **Operating Schedule and Employment**

The mine employees approximately 75 people at the present capacity, however if market or mining conditions dictate, as many as 125 people may be employed at the mine.

The mine will operate three eight hour production shifts per day, five days a week, with offshift personal splitting the production shifts. These offshifts will operate eight hours per day, five days per week. A maintenance crew will operate 10 hours a day, four days a week, to accommodate rockdusting and general cleanup of the mine. When market or mining conditions dictate, production can be expanded to seven days per week, 52 weeks per year.

#### **Safety training**

The mine is equipped with modern emergency facilities and has an organized safety program. All mine employees are required to meet MSHA first aid and safety training requirements. Visitors are required basic training before entering the mine.

#### **Fire protection**

Fire protection will be maintained in accordance with all Federal and State regulations pertaining to coal mining operations. Additionally the fire prevention plan can be found in Appendix 5-

**Water Systems, Dust Suppression, Dewatering, and Electrical:**

The sump area, as shown on Plate 5-4, will have a capacity of approximately 3.0 acre feet of water. The impoundment walls are constructed of concrete block with mortared joints and sealed on both sides. All the contact areas around the walls are sealed with concrete to prevent seepage. These sumps are constructed so as to allow the sediment to settle out and have an oil skimmer installed, as shown on Plate 5-4, to allow the water to be pumped directly to Crandall Creek under a NPDES permit. All water pumped to Crandall Creek will meet all effluent limitations and will be sampled in accordance with the NPDES permit requirements.

**5.24 BLASTING**

There are no structures or dwellings within one mile of the mine permit area. All blasting will be done under the direction of a person trained, examined and certified as provided by 30 CFR 850 and applicable regulations of the State Industrial Commission.

The use of explosives will be done in accordance with R645-301-524 and all records as outlined in R645-301-524.700 will be kept at the mine site or at the mine office in Huntington, Utah for a period of at least three years.

The applicant will post blasting signs, in accordance with R645-301-524.510, in the vicinity of the surface blasting operations indicating that blasting is being done in the area and the audible signals and meanings. The applicant will limit access to people from the area immediately prior to and after the blast until the applicants representative determines all is clear. Signals, audible within a half mile, will be given prior to and after the blast as outlined in R645-301-465.

The amount of explosives used within any 8 millisecond period will be determined with the following equation as outlined in R645-301-524.651.

Blasting will be done between sunrise and sunset, unless other criteria is met in R645-301-524.420.

Blasting will be done so as no fly rock will leave the permit area, where practical. Netting will be used to achieve this where there exists a possibility of this occurrence. Flyrock traveling in the air or along the ground will not be cast from the blasting site more than 1/2 the distance to the nearest occupied structure; beyond the area of control required under R645-301-524.530.

The term "subsidence" applies to the deformation or movement in the overburden thickness ranges from zero at the outcrop to approximately 1700 feet as shown on Plate 6-2. The strength of the overburden is typical of the late Cretaceous sediments that are mined in Eastern Utah and Western Colorado.

The magnitude of vertical subsidence is a function of coal height, overburden depth, stratigraphy, mining technique, and distance from barrier pillars. According to Dunrud's work completed in 1980, based upon a study of subsidence in an underground coal mine at Somerset, Colorado, published by the USGS in 1980, the maximum amount of subsidence expected is equal to 70% of the coal seam extracted, refer to Figure 5-4. The Somerset subsidence curves are included as reference within this report as the overburden characteristics are similar to that encountered at Crandall Canyon and the lack of reported data indicating amounts of subsidence for western underground coal mines. The maximum subsidence experienced for western coal mines according to Peng, ranges from 33 to 65% of the coal height extracted. Gentry and Abel have cited examples with maximum subsidence ranging to 70% of the seam height for western U. S. longwall operations. A 70% value will be used within this report. The maximum value may be reduced by the amount of coal not recovered in the mining areas, i.e., 20% of the coal is expected to be unrecoverable in the pillared areas at the Crandall Canyon Mine. For the areas near an unmined solid pillar the maximum amount of subsidence is reduced according to the graph shown in Figure 5-5 based upon referenced work in the United Kingdom by Gentry and Abel. The largest magnitude of subsidence that may occur is 3.9 feet at a point 40 feet east of the section line between Sections 5 and 6 and 1522 feet south of the section line between Sections 32 and 5. The values were calculated by reducing the coal heights shown on Plated 5-2C by 20% which represents the unrecoverable coal in the pillared areas (a six foot coal height was assumed due to lack of data), then multiplying by 70% to obtain the maximum possible subsidence value as obtained from Figure 5-4 which assumes a worse case scenario. The subsidence values were reduced according to Figure 5-5 for areas that border a barrier pillar along the perimeter of the lease shown on Plate 5-2.

Horizontal movement which would create slope failure is not expected to occur due to subsidence along the escarpment because only limited coal outcrop occurs within the lease. Within that area of old works no pillar extraction is anticipated. Areas along Huntington Creek directly above the coal outcrop have concern for failure are located approximately 1000 feet above the coal seam. As with areas in the western part of lease SL-062648 and at the COOP's Trail Canyon and Bear Canyon Mines and the Beaver Creek #4 mine, no escarpment failure has occurred. Horizontal movement creating tension or compression cracks can not be projected due to

# MAXIMUM SUBSIDENCE GRAPH

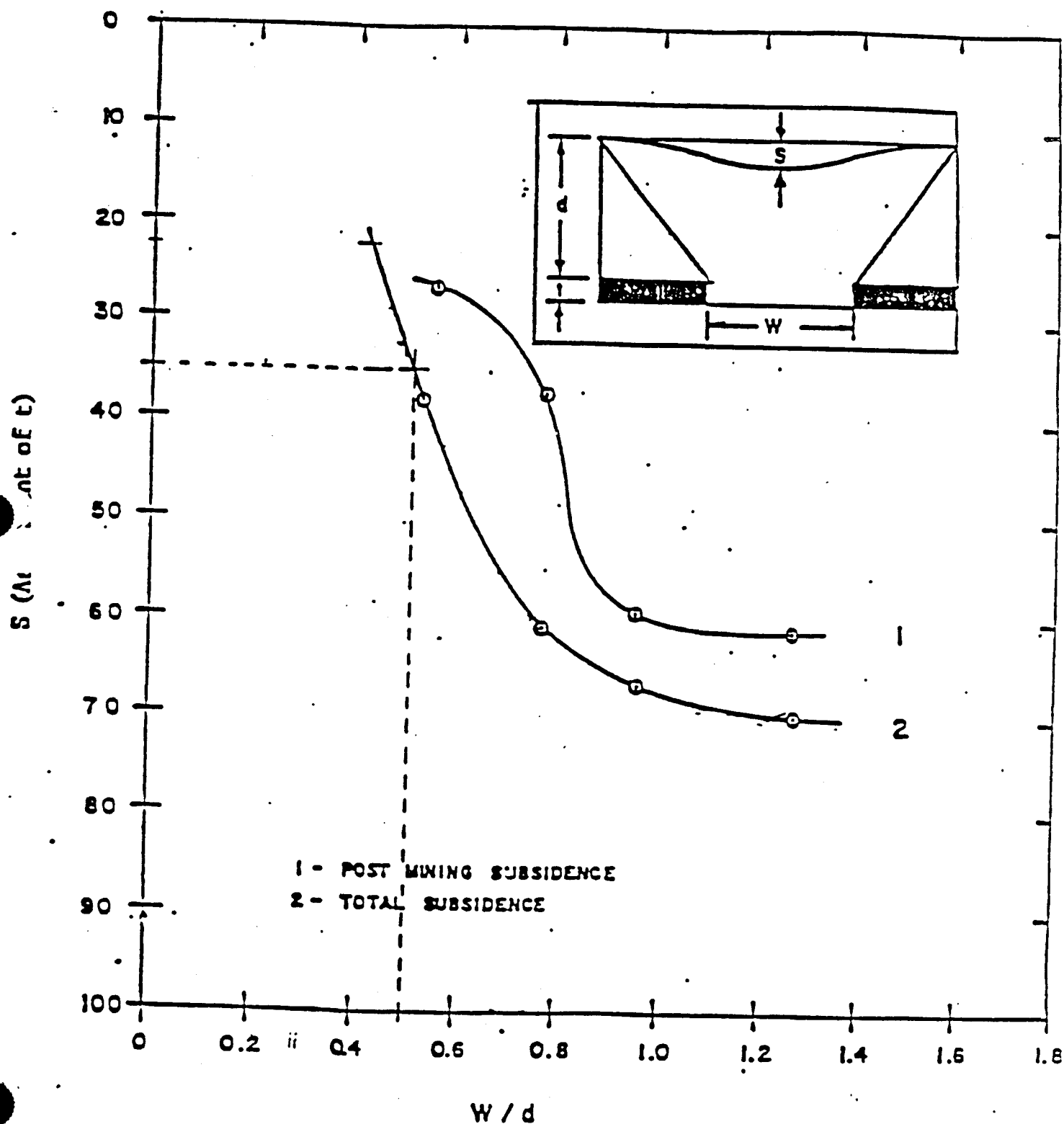


FIGURE 5-4

Maximum subsidence, as a percentage of seam thickness, versus width/depth ratio for room and pillar mining at Somerset, Colorado (after Dunrud, 1980).



GROUND SURFACE

ORIGINAL

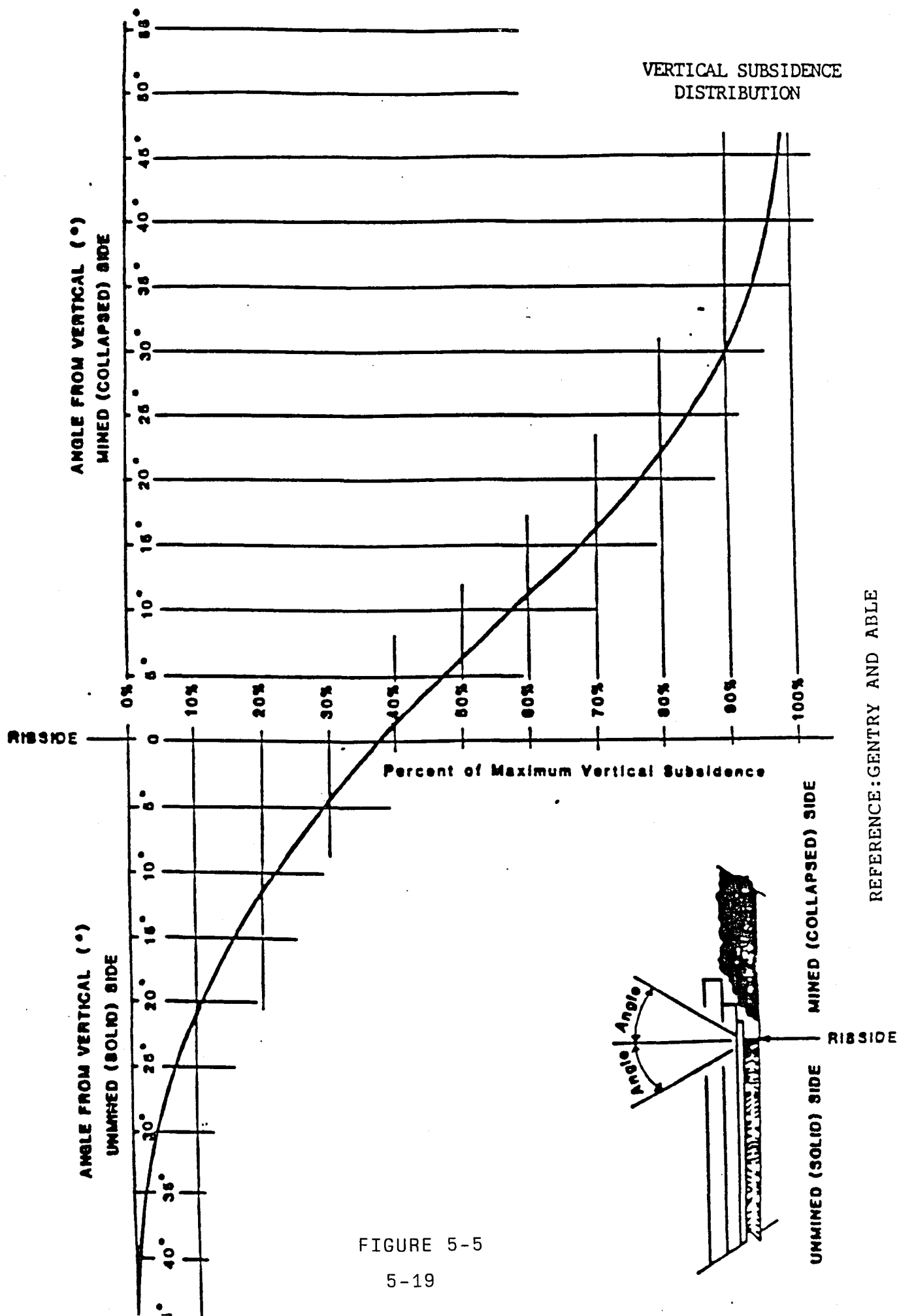


FIGURE 5-5

the overburden thickness and lack of jointing density and attitude data along the surface rock exposures.

It is accepted practice in this area to use two sources of information for subsidence evaluation. The sources are: 1) "Some Engineering Geologic Factors Controlling Coal Mine Subsidence in Utah and Colorado", Geologic Survey Professional Paper 969, by C. Richard Dunrud, 1976, and 2) "SME Mining Engineering Handbook", Volume 1, by Arthur B. Cummins and Ivan A. Given, 1973.

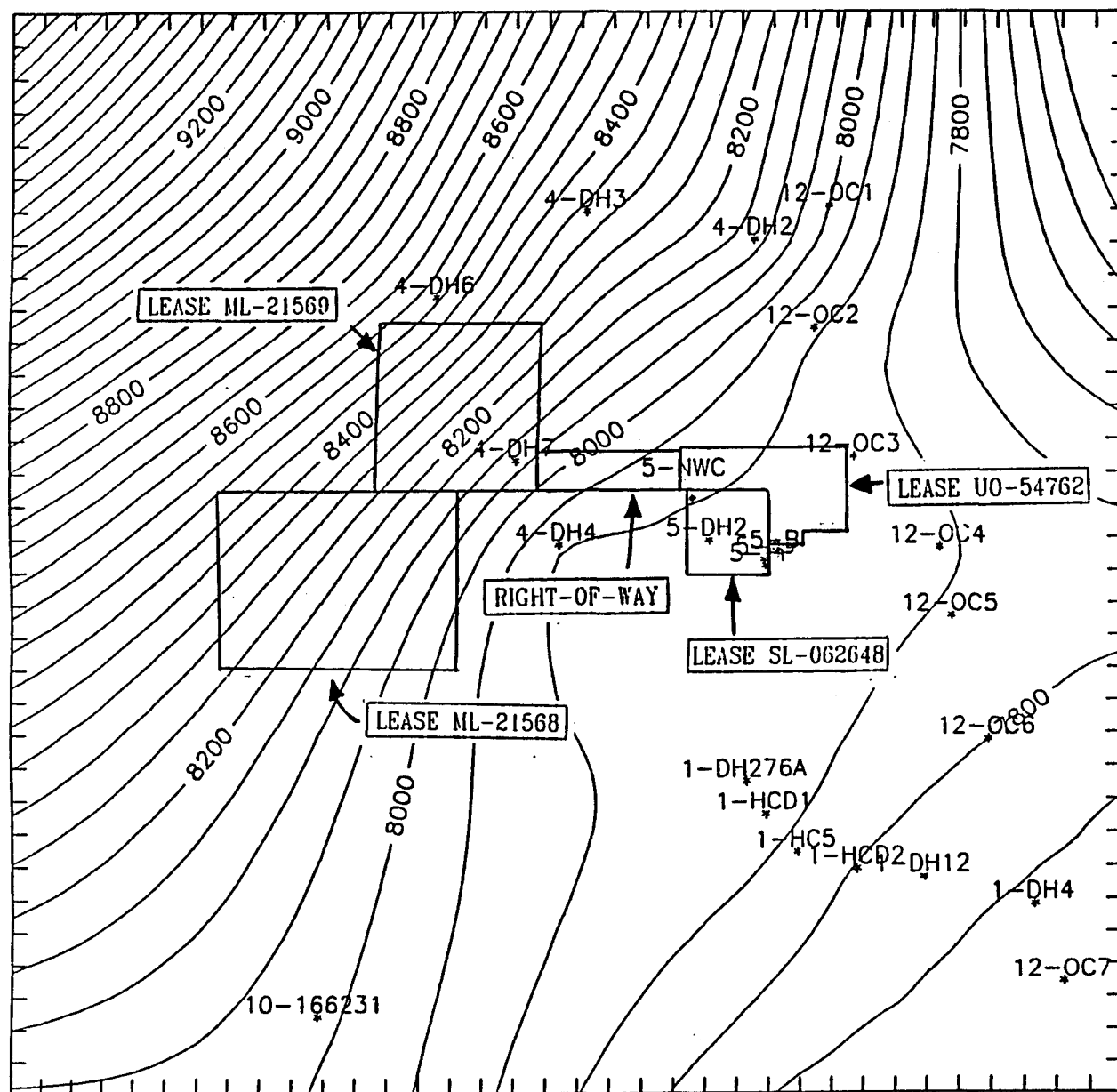
The conclusions based upon the above source material are tempered by on site evaluation and actual experience based on similar mining condition in late Cretaceous overburdens with similar thicknesses and strengths.

The surface area topography within the lease is shown on Plate 5-2, Plate 5-2A, and 5-2B. The topographic map shows the relative steep sloping sides of the canyons which contains Crandall Canyon creek, Blind Canyon creek, and Horse Canyon creek. There is little or no talus slope and rock outcrops are abundant.

#### 5.25.10 Subsidence Control Plan

The Subsidence Control Plan contained herein addresses specifically those items that are required by R645-301-525 Pertaining to Subsidence.

FIGURE 5-8



CONTOUR INTERVAL 50 FT.

SCALE  
0' 5000'



EarthFax Engineering Inc.  
Engineers/Scientists

FIGURE 5-8 STRUCTURE MAP

TOP OF HIAWATHA COAL SEAM.

This plan is an amendment to the original application filed on December 17, 1980, by Genwal Coal Company, Inc.; the SUBSIDENCE CONTROL PLAN FOR GENWAL COAL COMPANY, INC., as prepared by David A. Skidmore and L. G. Manwaring of Coal Systems Inc., on August 28, 1981; and the Mid-term permit revisions dated 5-30-86. The format of the currently approved COAL SYSTEMS report will be used with the conclusions based upon the results of the drilling of the Blind Canyon seam which was obtained in April, 1985, and the Hiawatha seam data obtained to date due to mine development. The original application was submitted pursuant to the following: Title 40, Chapter 10, Utah Code Annotated, 1943, as amended, the "Cooperative Agreement between the United States Department of Interior and the State of Utah"; the Surface Mining Control and Reclamation Act (P. L. 95-87); and all regulations promulgated under those Acts affecting mining operation conducted in the State of Utah.

#### Surface features and facilities subject to subsidence

An examination of the surface area as well as of state, federal, and county records indicate there are no man made structures, utilities right-of-ways and public or private resources necessitating protection from subsidence. Plates 5-12 and 5-13, Plate 5-3 of the area also confirm the preceding statement. Aerial inspection of the remaining area of the northern half of lease SL-062648 and the area covered by Coal Lease U-054762 resulted in the finding of no existing man made structures. The occurrence of subsidence will not produce material damage or diminution of value or foreseeable use of lands. Possible effects of mine subsidence on groundwater resources are discussed in Chapter 7.

Creeks within the area include Crandall Canyon Creek, Blind Canyon Creek, and the left fork of Horse Canyon.

The surface in the area is controlled and administered by the United States Forest Service with a small southern parcel of land owned by Mountain Coal Co. which has been leased by Genwal as shown on plate 2-1. The land is used for domestic grazing in the areas of gentle slope, wildlife habitat and recreation over the total acreage. The vegetative resources should not be negatively impacted by subsidence so that the current land use is expected to continue. Similar mining conditions and practices exist at Beaver Creek #4 Mine and CO-OP's Trail Canyon and Bear Creek mines. No significant loss of vegetation has occurred at those sites. The Crandall Canyon Mine on the western half of lease SL-062648 has experienced second mining under conditions similar to Huntington Canyon and has yet to experience any vegetation change, subsidence or escarpment failure. Visual impact will only be observed in the case of a total escarpment failure. Tension cracks, if any do develop, as viewed from the bottom of the canyons should not be visible at all and the maximum subsidence of three feet when viewed from below and at a distance of greater than 1/2 mile will not be

visible. As per the USFS, there is no marketable timber in the area of potential subsidence.

Since the original submittal, several operations and construction modifications have been submitted to satisfy regulatory compliance requirements.

Consideration was given to the subsidence experienced at nearby mines (CO-OP, Beaver Creek #4) exhibiting similar overburden composition and mining methods, on site inspections at the operating Crandall Canyon, CO-OP and Beaver Creek #4 mines and calculation based upon a generally accepted formula using limited physical coal strength data in determining coal pillar sizes, barrier pillar design and direction of mining. The aforementioned mines were observed from the surface to note any surface effects from subsidence from pillar mining. No substantial effects of the mining have been observed to date. The Crandall Canyon Mine has pillared coal in areas with as little cover as approximately 200' of overburden. The CO-OP and Beaver Creek #4 mines have pillared under the same types of escarpments as are located at the Crandall Canyon Mine with no apparent failures.

#### **5.25.11 Methods of coal removal**

The reserve area will be mined in the room and pillar method. This method is described in section 5.23 of this chapter.

#### **5.25.12 Description of Physical Conditions**

The depth of cover is shown on Figure 6-6. Seam thickness of the Hiawatha coal seam is shown on Plate 6-3. The Bear Canyon and Blind Canyon seam thickness is shown on Plates 6-4 and 6-5). Structure of the top of the Hiawatha seam is shown on Figure 5-8, 5-2A, and 5-2B. A description of the Lithology of the area is found in appendix 6-6. Other mine progress, interval, subsidence, and lithologic maps within this section and in the mine planning section also address the description of physical conditions.

#### **5.25.13 Measures to Prevent Subsidence**

In areas where mining may cause undesirable surface movement, steps will be taken to control or prevent subsidence. To prevent subsidence, permanent support can be achieved by selectively mining certain areas, leaving support pillars of coal, and/or by not mining specific areas.

Although planned subsidence is not projected due to the mining of the Hiawatha coal seam within the area of the Crandall Canyon Mine, potential subsidence may occur with in areas of retreated mining sections.

The main objectives are to delineate the areas within the

lease and adjacent lands that may be affected by subsidence and to determine the extent of the disturbance. Significant guiding design criteria are as follows:

1. Barrier pillars within the lease boundaries left intact to protect adjacent lands.

2. First mining only areas which depletes the potential chances of subsidence.

3. Research indicates that a 20 degree positive limit "angle of draw" should be used to project maximum extent of subsidence.

4. Protection of perennial streams using only first mining directly under and within a 20 degree angle of draw of the stream. Genwal recognizes that the Division of Wildlife Resources, the Division of Oil, Gas, and Mining, and the United States Forest Service consider all perennial streams to be important to wildlife. A buffer zone is shown on Plates 5-2, 5-2A, and 5-2B where no subsidence will take place until Genwal has delineated those reaches which exhibit perennial flow, and shown that mining activity will not adversely effect these stream reaches.

The 20 degree used to project the outer limits of subsidence and to protect perennial streams within the mining area was determined by two documents which show this angle of draw to be adequate. A Bureau of Land Management letter to the Utah State Division of Oil, Gas, and Mining dated Dec. 11, 1991 states that possible draw angle should be in the 15 to 20 degree range. This conclusion was made on previous history of subsidence occurring in the Wasatch Plateau/Book Cliffs area. This letter is identified as Appendix 5-5.

Appendix 5-6 is a report, "Preliminary Study of Potential Subsidence Over the Genwal Coal Mine". This report includes subsidence calculations, subsidence history, analysis, and charts with final conclusions showing that there may be a maximum subsidence result of 3 to 4 inches within the boundaries of the leased area, and the draw angle over the intact coal is expected to be of the order of 20 degrees.

5. There are no plans to backfill any area of the mine with waste material in order to reduce subsidence.

In order to delineate the maximum limit of possible subsidence in the vicinity of the Crandall Canyon Mine area, a positive limit (draw) angle of 20 degrees from vertical (70 degrees from horizontal) from the lease boundaries was used. A correction for topographic variability was made in order to accurately determine the maximum surface limit of subsidence. The maximum surface limit of possible subsidence is shown on Plates 5-2, 5-2A, and 5-2B. A discussion of the methodology used in determining the maximum limit

of subsidence is given in Appendix 5-7. Draw angles of 15 degrees or less have been observed in moderately strong overburdens in the Book Cliffs and Somerset mining areas of Utah and Colorado.

An incidental boundary change (IBC) of 50 acres is included in the Northwest corner of lease ML-21569. The IBC is for potential surface effects of mining only. No underground mining will take place within this IBC. A Forest Service Special use permit is in effect for this area and found in appendix 1-4 and shown on Plates 5-2 and 5-2A.

The method used in calculating subsidence magnitude as discussed within this section and Figures 5-4 and 5-5, the maximum amount of possible subsidence is only 3.5 feet, and occurs in the central portions of lease ML-21568. This 3.5 feet subsidence is worst case and will probably be in the order of 3 to 4 inches according to TerraTek.

#### 5.25.14 Subsidence Monitoring

The applicant commits to implement the proposed subsidence control plan and applicant hereby incorporates the same into this submittal.

The U. S. Forest Service has prepared an aerial monitoring system for the Crandall Canyon Mine which has been accepted for implementation. Vertical and Horizontal control have been established using ground control stations, shown on Plate 5-5. This method of subsidence monitoring has been accepted by other mines in the area and has met with DOGM approval. The program is included as Appendix 5-8. Baseline flight lines were flown over Sections 31 and 32 of T15S R9E, Sections 5 and 6 T16S R7E, Sections 1 and 2 T16S R6E, and Sections 35 and 36 T15S R6E in October of 1989. Control points within and adjacent to the leased area have been established and located by surveying practices. The area was then photographed, and a pin map was generated.

Aerial surveys will be conducted each year above and within the 20 degree angle of draw of the actual mined area. If no subsidence has occurred at a particular point for a period of two years, the point will be monitored biannually. If the biannual monitoring determines that subsidence has not occurred for three consecutive surveys, then the monitoring will be done on a five year increment.

The following information will be forwarded to the division on an annual basis when it becomes available:

1. A current map of the underground workings with areas delineated as to where the second mining will begin.
2. The approximate dates when second mining will commence and

terminate.

3. The date of monitoring.

4. The vertical and horizontal positions of all monitoring points and pins, directly over and within the 20 degree angle of draw to the mined area, surveyed by aerial photography for that specific year.

As required within the approved 1988 Mine and Reclamation Plan, a visual subsidence/escarpment failure survey has been completed for a period of two years at quarterly intervals at areas where mining has taken place beneath escarpment areas visible from Huntington and Crandall Canyon for a period of two years after development mining within those areas. There was no evidence of escarpment subsidence or failure. There is no further plans to monitor escarpments in the area not visible from Huntington or Crandall Canyon.

The subsidence/escarpment survey results were recorded and submitted to the appropriate regulatory authority. No escarpment failure occurred.

The water rights owned by the USFS are not affected whether subsidence occurs or not as the USFS is entitled to the quantity of water granted by these rights within the Crandall Creek drainage basin. Springs 93-1407 and 93-1409 are not within the limits of possible subsidence and will not require monitoring. Spring 93-1408 was not found in the location shown on Figure 7-3 in the permit application during the Spring and Seep Survey and described in Chapter 7. This apparent discrepancy can be explained after referring to the spring description in Appendix 7-1 which only gives a general location in a 40 acre area. Due to the even questionable occurrence of subsidence this distance from the active workings and the failure of locating the spring during a field survey the applicant does not propose monitoring spring 93-1408.

#### 5.25.15 Anticipated effects of planned subsidence

If subsidence does occur, the only surface effects will be minimal ground lowering.

#### 5.25.16 Mitigation of damages

As previously presented within this chapter, no material damage or diminution of value or foreseeable use of lands is expected to occur. Genwal has been in consultation with the BLM and received their concurrence with the conclusions presented in this document, a copy of the BLM correspondence may be found in Appendix 5-3 and 5-9. Displacement of wildlife due to subsidence may be minimal. However, springs within the potential subsidence



limit are a significant resource to the local wildlife and may be impacted.

Those seeps and springs that lie within the maximum limit of possible surface subsidence are delineated on Figure 5-9. Seeps and springs within the possible subsidence limit emit water from the North Horn, Price River Formations, The Blackhawk Formation, and the Castlegate Sandstone.

Within the possible subsidence limits of leases U-54762 and SL-062648 eleven seeps and springs were found to occur. Nine of the total issue from the Blackhawk Formation with two seeps issuing from bedding planes in the Castlegate Sandstone. Only SP-38 and 42 have evidence of use by deer and elk with flow less than one gpm. SP-30 produces one gpm with no deer or elk use. Subsidence from mining in Tract 1 and 2 and lease U-054762 will have minimal impacts on water supplies from seeps and springs in the vicinity of the mine. Displacement of wildlife due to subsidence may be minimal.

Seeps and springs within the possible subsidence limit of leases ML-21568 and ML-21569 emit water from the North Horn and Price River Formations 100 to 2100 feet (100 to 210 times the coal bed thickness) above the interval to be mined. If repeated subsidence via roof failure occurs, elastic deflation is believed to occur at a distance of nine coal seam thicknesses (90 feet) above the coal. If any tension cracks do develop, they should be sealed by clay migration occurring during elastic deformation. As a result, these seeps and springs should not be affected by subsidence, however monitoring will be conducted as described in chapter 7.

Genwal recognizes the fact that the Division of Wildlife Resources and the Division of Oil, Gas, and Mining consider all seeps and springs to be important to wildlife. If, during the monitoring of the springs, it is proven that mining activities have reduced the flow of any seep or spring in the area by 50% or more, Genwal will notify the Division of Wildlife Resources, the Division of Oil, Gas, and Mining, and the U. S. Forest Service and begin working on an acceptable mitigation plan involving the use of guzzlers. These guzzlers will be designed in cooperation with the Division of Wildlife Resources, The Division of Oil, Gas, and Mining and the U. S. Forest Service and placed in the area of the effected spring. No other sources of water, other than the springs located by the seep and spring survey, are known to exist in the mine plan area. Genwal owns shares in the Huntington-Cleveland Irrigation Company that can be transferred if required to meet the demands of an alternate water supply.

In the event subsidence negatively impacts grazing, the applicant will compensate the owner or appropriate the party by paying the fair market value for the loss experienced. Compensation will be made after the grazing loss is proven to have

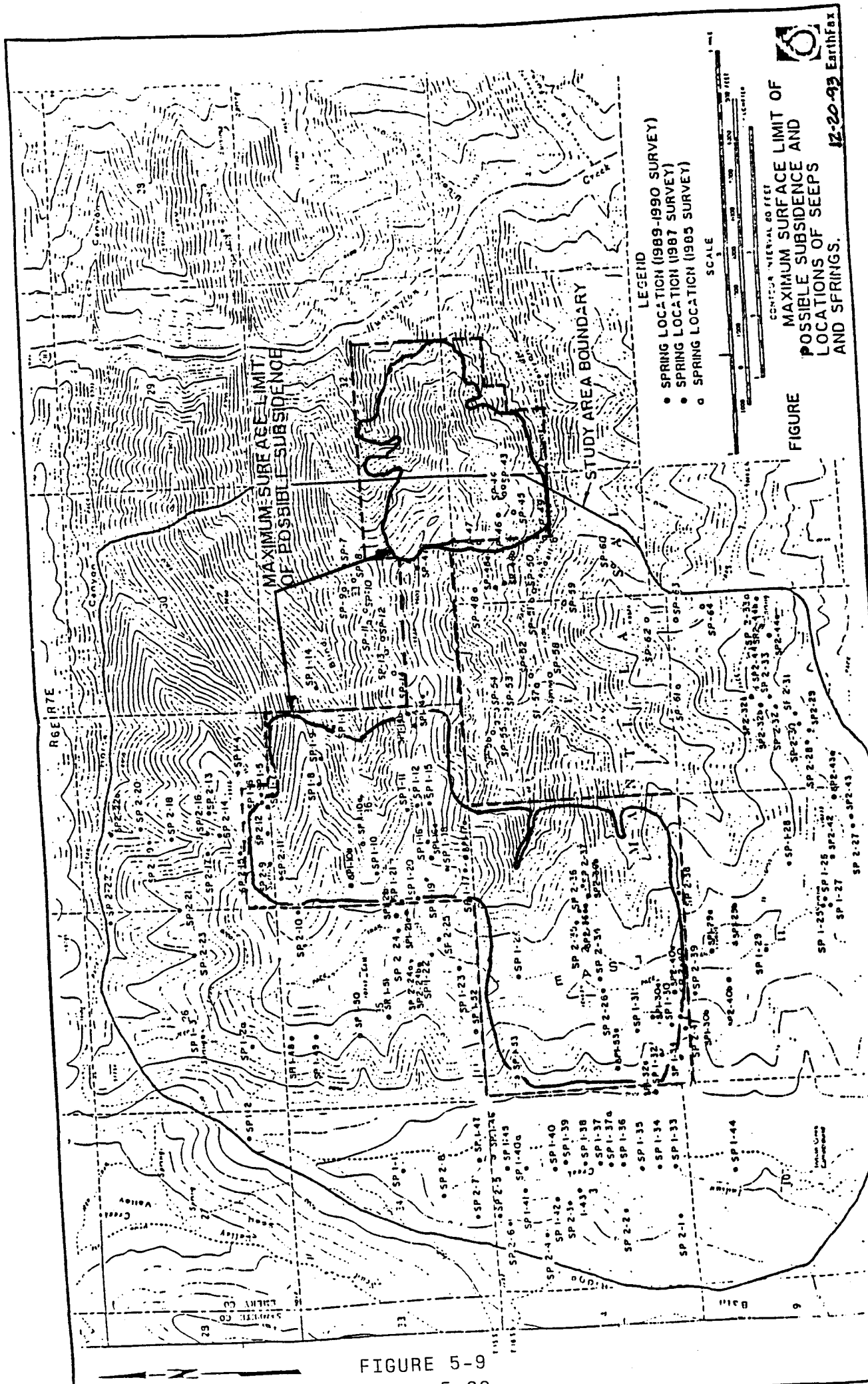


FIGURE 5-9

FIGURE  
MAXIMUM SURFACE LIMIT OF  
POSSIBLE SUBSIDENCE AND  
LOCATIONS OF SEEPS  
AND SPRINGS.

12-20-93 EarthFax

resulted from surface subsidence related to the operation of the Crandall Canyon Mine.

Should any structures such as roads, bridges, etc., be adversely impacted as a direct result of subsidence directly related to the operation of the Crandall Canyon Mine, the operator will repair or replace the structure, whichever is more economical.

#### **5.25.20     Subsidence Control**

Genwal Coal Company will comply with all provisions of the approved subsidence control plan and will correct any material damage resulting from subsidence to surface lands as a direct result of the operation of the Crandall Canyon Mine. This will be done to the extent technologically and economically feasible, by restoring the land to a condition capable of maintaining the value and reasonably foreseeable uses which it was capable of supporting before subsidence.

The mine plan is designed so that mining will not result in material damage to perennial streams or impoundments having a storage volume of 20 acre feet, or which could result in environmental degradation or safety hazards to streams and associated structures.

#### **5.25.30     Public Notice of Proposed Mining**

At least six months prior to mining, or within that period if approved by the Division, all owners and occupants of surface property will be notified, by mail, identifying specific areas in which mining will take place, dates that specific areas will be undermined, and the location or locations where the operator's subsidence control plan may be examined.

#### **5.26            MINE FACILITIES**

The site selection was limited to the only area where the coal outcropped in the lease area. This is extremely small at this point and very few options were available at the time of construction. See Plate 5-3 for the surface layout and Plates 3-7, 3-8, and 3-9 for the premining land configuration.

A Forest Service road use permit was obtained from the United States Forest Service, Manti-La Sal National Forest, Price, Utah in order to build, use, and maintain the road to the mine permit area. This Forest Development road does not lie within the permit area and is not included as part of this permit application. The Forest Service road that passes by the mine site will be included in the permit area for the purpose of drainage control.

The topsoil was stripped according to the plan, stockpile, and seeded with the topsoil stockpile seed mix. The topsoil stockpiles are protected from encroachment by placing earthen berms, straw bails, silt fences, or equivalent where needed.

There are no pre-existing structures or facilities located within the permit area. Genwal has constructed a metal building (80' x 40') used as an outside shop. A new warehouse and office complex (50' x 25') has been built east of and connected to the existing shop. An additional 30' x 20' shop bay is projected to be added to the existing shop in 1993.

During the summer of 1990, a power line from Utah Power & Light was brought in across the top of the canyon. At this time the use of the diesel generator was terminated. Presently, a state of the art substation and transformer provide all power needs. The high voltage lines from the substation to the mine are run underground in cement covered conduit thus eliminating the need of overhead power poles and transmission lines.

The oil storage and fuel containment area (80' x 20') is located approximately 90' west of the coal silo. This containment area is of sufficient volume to hold the volume of the largest storage tank found within the containment area. The containment area has a valve connected to the drain inside the wall. The valve and drain will provide a means for removing any spills or water in the containment area. A certified SPCC plan outlining emergency action as per R645-301-730 is available at the mine site (Appendix 5-10). Refer to Plate 5-3 for all surface buildings and structures.

An underground bathhouse has been constructed to provide shower and sanitary facilities for the miners. This underground bathhouse is designed and installed in accordance with all State Health, MSHA, and Forest Service regulations. These agencies were contacted prior to the design and implementation for their input and approval as necessary. The water and sewage plans can be found in Appendix 5-11 and 5-12 respectively.

Two mine fans located on the surface, as shown on Plate 5-3, are used to ventilate the mine workings to insure a sufficient amount of oxygen for mine employees to continue operations within the mine.

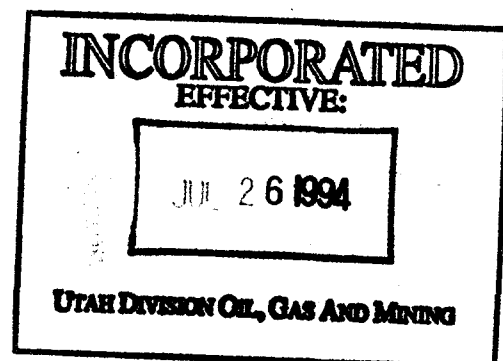
Other structures such as cement guard rails and cement walls have been constructed, with the Division's approval, and are listed within pages 5-33 and 5-34. This list includes the approximate date of completion of each structure and the description of each construction project.

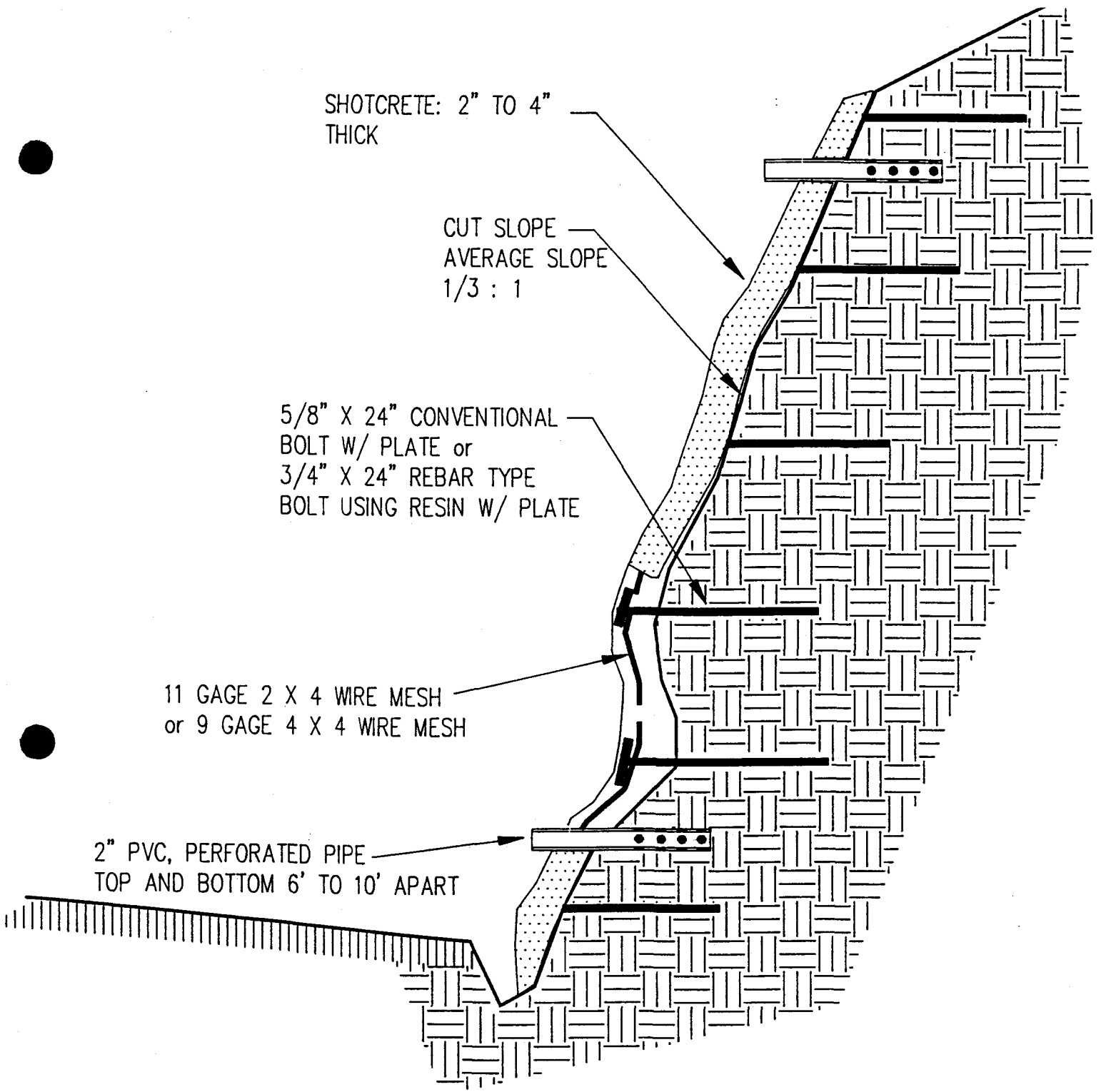
Shotcrete will be sprayed onto the cut slope above the portals and above the portal road. A 4" square wire mesh will be used, being spaced approximately 1" to 2" away from the existing slope. The wire mesh will be secured to the slope with standard metal clips. 2" PVC pipe, perforated for drainage, will be inset 2 to 3 feet into the slope at two different elevations, approximately 6" to 12" from the bottom of the project and 12" to 24" from the top of the project. These pipes will be spaced 6 to 10 feet apart for the entire length of the project. 2" to 4" of shotcrete will then be sprayed onto the wire mesh. The intent of the project is to better stabilize the cut slope to eliminate slufage and enhance safety for personal.

#### **Specifications for Shotcreting cut slopes**

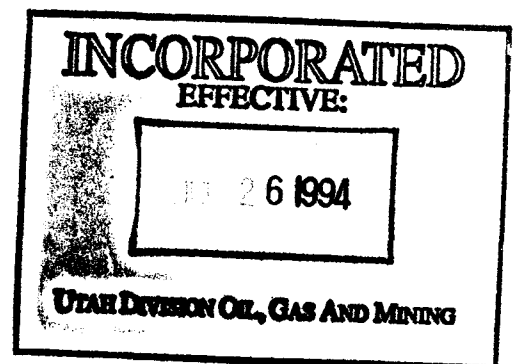
Average slope: 1/3:1  
Matting: 11 gage 2" x 4" or 9 gage 4" x 4" wire mesh  
6' wide x full length of slope  
Securement: 5/8" x 24" long bolts w/ plates or  
3/4" x 24" long rebar type anchors w/ plates  
spacing maximum 5' centers  
Drainage: 2" PVC pipe, 24" long, perforated, located  
at top and bottom of slope, 6' to 10'  
on centers. Pipes will be inset into the slope  
with the end extending outside the shotcrete.  
Drainage of the slope will be collected by  
the 2" PVC pipes and allowed to flow to the  
outside of the shotcrete.  
Shotcrete: 1800 lbs sand  
(per batch) 800 lbs pea gravel  
425 lbs cement  
400 lbs fly ash  
Application: Applied with a Reed Sova III or  
Reed M40 pump w\ accelerator.  
Minimum thickness applied 2"

See Figure 5-10 for a cross sectional detail of shotcrete application.





TYPICAL SHOTCRETE APPLICATION  
TO CUT SLOPES  
SCALE: NONE



## Coal Handling

Coal exits the mine on a 48" conveyor belt and drops either into a primary crusher or secondary crusher. Coal entering the primary crusher will be crushed then conveyed directly to the silo. From the silo, it is weighed and loaded into coal trucks. Coal entering the secondary circuit is crushed at the secondary crusher and conveyed over the bench, and deposited onto a 2000 to 3000 ton capacity storage pile. The secondary circuit is only used if the primary circuit is disabled, down for repairs, or if the coal volume exceeds the capacity of the primary crusher. It is estimated that only 8% of the total production will be handled by the secondary system. A loader operation will transfer coal from the stockpile to a 3rd coal hopper and crusher, where it is conveyed to the coal trucks (see Plate 5-3).

An automated coal processing facility has been installed at the Genwal mine site. The facility, as-built layout, can be found on Plate 5-6. Design calculations are located in Appendix 5-13.

## Power System, Transmission Lines, Substations, Feeders.

Power for the mine, both underground and surface use, is provided by newly installed transmission lines from Utah Power, and Light. The new substation and transformer built by PEMCO is state of the art and will provide 7200 volts to surface and underground power centers. The power lines run in underground cement covered conduit from the substation to a visual disconnect located by the bathhouse portal. From the visual disconnect it travels through 4" steel conduit into the mine. All electrical installations meet the appropriate 30 CFR Part 75 and 77 MSHA regulations. The placement of electrical installations can be found on Plate 5-3. Plate 5-8 gives a detailed layout of the new substation and transformer facility.

Utility poles located on the surface will be constructed to protect raptors, all wires will be insulated and there will be no exposed conductors. All electrical installations will be done in accordance with MSHA regulations.

## Surface Equipment

Underground supply equipment will be used on the surface as needed. The following is a list of equipment used exclusively on the surface:

- Fork Lift
- Snow Plow
- Front End Loader
- Pick-up Trucks
- Diesel Tractors
- Bobcat tractor

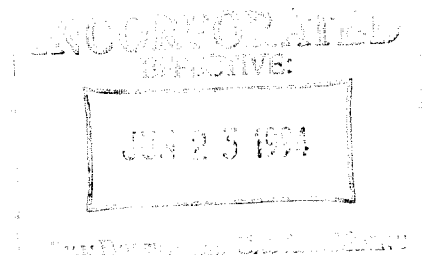
CONSTRUCTION SCHEDULE  
1989-1992

DATE	DESCRIPTION
1990	Automated Truck Load-out- 450 ton silo loading belt w/ belt scale
1991	Dual crusher system- concrete pad and enclosure silo belt secondary 1992 enclosure
1991	Intake portal canopy
1991	Belt portal cement pad and update all electrical installations.
1991/92	Dual exhaust fans with cement pads and state-of-the-art fan transformer
1990	Chainlink fence and cement barrier at portal area
1990	Surface (portal) storage building
1990	Electrical substation (state-of-the-art) with overhead transmission lines
1990	Cement of underground electrical conduits from substation to bathhouse
1990	Cement substation retaining wall
1990	Cement trash area
1990	Microwave telephone/radio systems
1991	80' x 40' outside shop
1992	50' x 25' outside warehouse/office
1990	Bulk rock dust tank
1991	Asphalted surface of parking and storage area
1991	Bulk oil station (cement pad and retaining walls) and 20' x 20' cement storage pad
1991	Cement turn around for haul trucks
1991	Cement pad for loading coal trucks



CONSTRUCTION SCHEDULE  
1989-1992

DATE	DESCRIPTION
1989-91	Additional culverts for proper drainage
1990-91	Cement clean-outs for culverts
1990	Cement pad and complete water facilities for water truck
1991	Cement guard rail along truck turn-around (from load out to upper pad)
1991	Haulage road upgrade and widened gabion basket wall by sediment pond hilficia wall to widen road and stabilize embankment asphalt surface- 1.2 miles delineation and striping of road with correct signs
1989-92	Underground warehouse and bathhouse cement floors and block walls for warehouse and bathhouse, conference room, 3 offices upgrade showers and change room upgrade all electrical, water system, lighting heating, etc.
1993	Asphalting of portal road
1993	Modification of lower pad storage area
1993	Addition of loadout platform scale ramps and supporting construction
1994	Addition of shop bay expansion
1994 (proposed)	Modification of lower pad storage area
1994	Shotcrete of cut slope above loadout
1994	Shotcrete of cut slope above portal road & portals.



### **Culinary water system**

The culinary water used at the mine will be purchased from a vendor, supplied from the Huntington City water supply, or taken from the deep well located at the mine portals. This deep well has been installed in accordance with state health regulations for culinary use. The culinary water will be placed in containers designed for this purpose.

The water used underground will be placed in the mine sumps located underground. The location of the sumps will change as mining progresses across the reserve and will not remain in any one area permanently. These sumps will be filled with water produced underground, or from a pump located in Crandall Creek.

### **Sewage System**

The bathhouse, located underground, was designed and constructed in accordance with the State Health Departments rules and regulations. The sewage will be contained in a concrete holding tank and pumped by a licensed contractor and disposed of at a State approved sewage treatment plant. The sanitary facilities underground will comply with all MSHA regulations. The sewage facility can be found in Appendix 5-12.

### **Sedimentation Control Structures and Water Treatment Facilities.**

The existing sedimentation pond was reconstructed during the 1986 and 1989 construction seasons in accordance with R645-301-526.300, as detailed in the Runoff and Sediment Control Plan located in Chapter 7.

Underground sumps will be built in order to effectively treat underground water before discharging into Crandall Creek, refer to Plate 5-4 for the sump locations. These sumps will be designed and submitted to the EPA for approval before discharge begins. All discharge into the creek will meet effluent limitations of the NPDES permit and monitored in accordance with same, refer to Appendix 5-14.

The sediment pond and the underground sumps are the only water treatment facilities proposed at the mine site.

The NPDES permit has been issued for the sediment pond and is included as Appendix 5-14.

#### **5.26.21**

All coal mining and reclamation operations will be conducted in a manner which minimizes damage, destruction, or disruption of services provided by oil, gas, and water wells; oil, gas, and coal

slurry pipelines, railroads; electric and telephone lines; and water and sewage lines which pass over, under, or through the permit area, unless otherwise approved by the owner of those facilities and the Division.

#### 5.26.22

Support facilities will be operated in accordance with a permit issued for the mine to which it is incident or from which its operation results.

#### 5.26.3 Water Pollution Control

See "Waste Disposal Plans" under the Mining Operation section of this chapter.

#### 5.26.4 Air Pollution Control

Coal mining and reclamation activities will be conducted in accordance with R645-301-420 and the Air Quality Approval Order issued by the Utah Division of Air Quality (Appendix 4-7).

#### 5.27 Transportation Facilities

The coal from the mine will be transported to the rail loadout or final destination by truck. The trucks are typical 45 ton tandem trailer coal haulers used in the Utah coal fields. Genwal uses a loading site on the Utah Railway located at Mohrland, Utah, a loading facility on the Denver Rio Grande Railway in Wellington, Utah, and other independently owned loadouts within the Carbon/Emery county area.

The Forest Development Road from Huntington Creek to the truck turn around area was constructed under the definition of a class one road and will be maintained as a primary road, in compliance with the road use permit issued by the U. S. Forest Service, Manti-La Sal National Forest. The forest access road will remain as part of the post mining land use in accordance with the Forest Service Permit (Appendix 1-2). The Forest Service Access Road, built under the definition of a Class two road, is maintained as a primary road. It runs to the main pad area from the truck turn around area and is designed, maintained and restored in accordance with the Forest Service road use permit. The road from the main pad area to the portal area was built under the definition of a Class two road and is maintained as a primary road. It is designed (as shown on Plate 5-10), maintained and restored in accordance with R645-301-527.120. The Ancillary road to the upper pad was built under the definition of a Class three road and was designed (as Shown on Plate 5-10), is maintained and restored in accordance with R645-527.130.

The Forest Service Development road has been designed and

approved by the USFS prior to construction. The design drawings are on file with the Manti-La Sal National Forest in Price, Utah. During the 1991 construction season Genwal Coal Company improved and asphalted the Forest Service Development road and surface facilities area of the Crandall Canyon Mine (as shown on Plate 5-3). The improvement information covering the haul road and facilities area is addressed in Appendices 5-15, 5-16, and 5-17.

The Forest Service road (primary road) is utilized by coal haul trucks, mining equipment (on a limited basis), support vehicles, employees, and recreational users (public). The two roads located on the permit area, the portal pad road and the access road to the main pad from the truck turn around area, are utilized by both surface and underground mining equipment, support vehicles, and employee vehicles. The Ancillary road to the upper pad area is utilized by service vehicles on a very limited basis.

The Ancillary road to the upper pad has been reseeded.

Two parking areas will be maintained at the mine site. These parking areas, the upper main parking area and the loadout area will be utilized for equipment and employee parking. The forest parking area past the mine site was preserved for primarily recreational/forest service parking. The Forest Service parking area and/or the sedimentation pond will be used during the winter months for snow storage.

The plan view for the above roads may be found on Plate 5-3. The typical cross section for each road and their corresponding profile may be found on Plate 5-10.

#### 5.27.2 Transportation Facilities

Coal exits the mine on a 1200 ton/hr 48" conveyor belt and drops either into a primary crusher or secondary crusher. Coal entering the primary crusher will be crushed then conveyed directly to a 650 ton silo (see Plate 5-6). From the silo, it is weighed and loaded into coal trucks. Coal entering the secondary circuit is crushed at the secondary crusher and conveyed over the bench, and deposited onto a 2000 to 3000 ton capacity storage pile. The secondary circuit is only used if the primary circuit is disabled, down for repairs, or if the coal volume exceeds the capacity of the primary crusher. It is estimated that only 8% of the total production will be handled by the secondary system. A loader operation will transfer coal from the stockpile to a 3rd coal hopper and crusher, where it is conveyed to the coal trucks as described in section 5.27 (see Plate 5-3).

Roads in the permit area are inspected in order to determine the maintenance required to minimize and correct erosion problems before they become extensive. Maintenance will be performed as required to control erosion. This maintenance will include

maintaining the ditches, resurfacing when needed and maintaining proper drainage.

See Plates 5-3, 5-10, 5-19, and Appendix 1-2 for more sections and details of the roads within the permitted boundaries.

If a road is damaged by a catastrophic event, such as a flood or earthquake, it will be repaired as soon as practical after the damage has occurred.

## **5.28 Handling and Disposal of Coal, Overburden, Excess Spoil and Coal Mine Waste**

### **5.28.10 Coal Removal, Handling, and Storage**

See section 5.26 of this chapter. See section 5.4 for removal and reclamation.

### **5.28.20 Overburden**

See section 5.28.30 for removal and reclamation.

### **5.28.30 Spoil, Mine Development Waste, and Noncoal Waste Removal, and Overburden.**

The Crandall Canyon Mine produces a run of mine product for final sale, this product does not contain any mine related rock or development waste. The method of mining used at the Crandall Canyon mine produces no development waste, however small amounts of rock waste is generated in unexpected roof falls and overcasts. This rock waste is not brought to the surface. It is disposed of on pillar lines or stored in areas that have been mined and no second mining is to be done. The material disposed of on the pillar lines will be of the same nature that naturally caves in the pillaring process, therefore no leachate will be formed other than that associated with normal pillaring. In no event will the disposal of this material interfere with future recovery of the coal resource without consent of the BLM or the managing agency of the coal resource. In the unlikely event either rock, development, and/or processing waste is encountered, and the volume exceeds the capacity that can be disposed of along pillar lines; Genwal commits to disposing of the waste in a DOGM licensed disposal facility. Genwal will notify and consult with DOGM regarding disposal sites; all waste disposal will be done in accordance with MSHA regulations.

The waste generated by the normal activities which include, but not limited to the following: wood, paper, scrap metal, belting, etc., will be disposed of underground on pillar lines where possible in accordance with MSHA regulations. No oil or grease will be intentionally disposed of underground. All solid waste brought to the surface will be disposed of in a trash

container until the container becomes full, at which time the container will be transported to a State approved landfill for final disposal. At the present time the landfills to be used will be the state approved Nelson landfill or American Kinfold landfill (M&P Enterprises, which are located next to the county landfill, approximately 1.5 miles north of Orangeville, Utah, and another State approved landfill becomes available and more cost effective this landfill will be utilized. The operator will notify the Division prior to any waste disposal in any landfill other than those mentioned. The location of this landfill and a statement from the DOH indicating the landfill permit number, the permit term and any conditions that the DOH has concerning the disposal of noncoal waste will be submitted to the Division. In no event will liquids be disposed of in landfills that are not permitted to handle such material.

Scrap metal and used equipment will be stored underground or on the surface next to the solid waste container until the material is sold to a scrap metal or used equipment dealer.

Oil contaminated soil from the gas and oil storage area will be disposed of prior to reclamation or moving of the facility. Areas outside the containment area will be cleaned and disposed of when an area of 10 square feet is saturated. The contaminated material will be disposed of at a facility licensed to accept oil/gas contaminated soil.

#### **Processing Waste**

No processing waste is generated at the Crandall Canyon Mine. There exists no partings in the coal mined at the Crandall Canyon Mine. The sole rock type removed from the mine is coal, all of which is trucked off site and sold.

Exploratory drill hole data and mining conditions indicate that no development or processing waste will be produced. However, in the unlikely event either rock, development and/or processing waste is encountered, and the volume of waste generated exceeds the capacity that can be disposed of along pillar lines, Genwal commits to disposing of the waste in a DOGM licensed disposal facility. Genwal will notify and consult with DOGM regarding disposal sites. All disposal operations will be in compliance with Utah Coal Mining regulations R645-301-536 and R645-301-746.

#### **Hazardous Wastes**

In the unlikely event that hazardous or toxic material is encountered, Genwal will notify the Division as well as the State Health Department; the hazardous or toxic material(s) will be disposed of at a facility permitted to accept the specific contaminants found.

### **Sediment Pond Waste**

Sediment (excess spoil) removed from the pond during the cleaning process will be either 1) returned to the mine workings and disposed of in compliance with MSHA regulations, or 2) hauled to a DOGM licensed coal waste disposal facility. All moisture and runoff from the pond cleaning will be contained by the pond. Prior to cleaning the sediment pond, representative sediment samples will be collected and analyzed for any acid- and/or toxic forming materials, and the volume of excess spoil to be disposed of will be calculated. If the analytical results exceed the toxic limit, the waste material will be handled and disposed of in compliance with regulations applicable to acid- and/or toxic forming materials. Following receipt of the analytical results and determining the volume of waste to be disposed of, and prior to cleaning of the sedimentation pond and disposal, Genwal commits to notifying and consulting with DOGM regarding disposal of the waste 60 days prior to disposal. Disposal of excess spoil will be in compliance with Utah Coal Mining regulations R645-301-535.100.

### **Sanitary Waste**

There will only be two or three regularly assigned employees on the surface per shift. These surface employees will use the bathhouse for their sanitary waste needs.

Waste from the underground bathhouse toilets and showers is pumped to a holding tank located underground. When required the holding tank is pumped and the materials are disposed of by a licensed contractor at a State Health approved disposal site. See Appendix 5-12. The applicant will keep records of the sewage pumped from the tank by the contractor.

The sanitary waste needs for the miners underground will be handled in accordance with MSHA regulations.

### **5.29 Management of Mine Openings**

Five portals have been placed on the Starpoint Sandstone in the Hiawatha coal seam. Four of the five portals are used while one of the portals is sealed. Three portals are used for intake ventilation, beltline, and return ventilation. The fourth portal opening is used for access to the underground bathhouse. Two identical fans located at the return portal will operate in parallel. One fan will discharge horizontally and the second vertically.

These portals existed during previous mining attempts and will be utilized during current mining operations. The highwall above the portals has been secured and canopies have been installed to bring the portals up to MSHA standards.

During operation of the Crandall Canyon Mine, access to all mine openings are controlled by the operator during working and nonworking hours. Due to public access through the mine site, a security person is located at the mine during times of no work or when surface personnel are not present.

Permanent sealing of underground openings is discussed in section 5.42.71 of this chapter.

#### 5.30 Operational Design and Plans

#### 5.32 Sediment Control

The design of the sediment control structures is presented in chapter 7 section 7.42 of this document. The designs are intended to minimize the disturbance to the hydrologic balance by distributing the smallest practical area at any one time during the mining operation through progressive backfilling, grading, and prompt revegetation as required in R645-310-353.200, and to stabilizing the backfilled material to promote a reduction of the rate and volume of runoff in accordance with the regulations.

#### 5.33 Impoundments

The only impoundment on the Crandall Canyon Mine site is the sedimentation pond. The design of the sediment control structures is presented in chapter 7 section 7.42 of this document. Minimum static safety factors can be found in Table 7-7 page 7-101. The sedimentation pond meets criteria of R645-301-533 as shown in appendix 7-10 page 7.

Due to the physically confining topographic constraints of the canyon, the sedimentation pond does not meet the regulatory requirement of a minimum 1v:5h combined upstream and downstream side slopes for the settled embankment. EarthFax Engineering, Inc. has conducted the sediment pond design and stability analysis which is incorporated in Chapter 7 section 7.42 and Appendix 7-6.

#### 5.34 Roads

The primary roads associated with the Crandall Canyon Mine have been located on the most stable available surfaces. They have been surfaced with materials (gravel, road base, asphalt, etc.) approved by the Division as being sufficiently durable for the anticipated volume of traffic and weight and speed of vehicles using the road. All roads falling under DOGM regulations are built on cut material and as a result no embankments were used during road construction. The roads are routinely maintained to include repairs to the road surface, blading, filling potholes and adding replacement surface material when needed. Culverts and ditches have been installed and are maintained to sustain the life of the



roads during the operational life of the mine. See Plate 7-5A for the location of culverts and Appendix 7-11 for the culvert designs. See section 5.27 for further information on these roads.

The area not designated as a primary road is the upper pad. This area has been asphalted to the approval of the Division. The pad is utilized for parking, loading and unloading of supplies and equipment, storage for those supplies, a staging area for new and rebuilt underground equipment, and access to the primary road to the portal area. It is maintained to include repair to the pad surface, blading, filling potholes and adding replacement surface material when needed.

Roads within the permit area used for mining operations will comply to R645-301-534.100 through R645-534.340.

#### 5.35 Spoil

There are no permanent refuse sites located on the property. All spoil is controlled and maintained as described in section 5.28.30 and section 7.54 of chapter 7.

#### 5.36 Coal Mine Waste

See section 5.28 of this chapter

#### 5.37 Regraded Slopes

The following information supplied is incorporated within the currently approved mine plan and variances have been granted.

If a slide should occur within the permit area, applicant will notify the regulatory authority and comply with the remedial measures required by the regulatory agency.

The applicant concurs, that 1:1 excavation slopes are not suitable in the superficial topsoil deposits and have included slope rounding of these slopes at 1.5:1 in our details. If the factor of safety of 0.72 was correct, most areas of the existing canyon would already have failed as the natural slope approaches 1:1 in the entire canyon. Any excavation slope greater than 1:1 (with exception of slope rounding) would be unrealistic and impose unnecessary impact far beyond the current limits. In many instances, a 1.5:1 excavation slope is not realistic as the topography of the canyon exceeds this value.

Careful monitoring of construction in critical areas will be necessary to identify and use the correct design profile (i.e. 1:1, 1/2:1, or 1/4:1 slopes).

The stability of the recontoured slopes has been demonstrated by the contemporaneous reclamation in evidence at the property. A number of these slopes are in excess of the proposed 1.5 to 1 final

reclamation contours and have been in place for over ten (10) years. Genwal will continue to observe these slopes and in the event that a failure occurs or evidence of instability is noted, such as sluffing, tension fractures, etc., all regulatory authorities will be notified and an acceptable plan to modify the proposed final reclamation contours will be agreed upon at a minimum of five (5) years prior to cessation of mining.

In addition to the access/haul road included within the permit area along Crandall Canyon to the truck turn around area, there are two other primary roads. One is from the truck turn around to the upper pad and the other is from the upper pad to the mine portals. The roads are used to access the portal and substation areas and operations area as shown on Plate 5-3. Cut slopes of 0.25h:1v for competent bedrock, 0.5h:1v for fractured bedrock and 1h:1v for shallow surficial deposits less than four feet deep overlaying bedrock are proposed for the portal access roads. A slope stability investigation was submitted by Delta Geotechnical Consultants and is included as Appendix 5-19 with a safety factor of 0.72 for the shallow surficial deposits of the proposed 1:1 cut slopes. Since the safety factor does not comply with UMC 817.162(c) requirements, cut slopes with 1:1 slopes will be rounded to 1.5:1 in the shallow superficial material. Appendix 5-16 is a stability analysis of the storage pad (upper pad) at the Crandall Canyon Mine prepared by EarthFax Engineering, Inc.

#### 5.40 RECLAMATION PLAN

##### 5.41 General

When no longer needed for mining operations, all entry ways or other openings to the surface from the underground mine will be sealed and backfilled. The permanent closures will be constructed to prevent access to the mine workings by people, livestock, and wildlife. Potential surface drainage will also be kept from entering the sealed entries.

Prior to final sealing of any openings, the MMS will require an on site inspection and a submission of formal sealing methods for approval of the MMS. The formal sealing methods will be presented as a plan including cross sections demonstrating the measures taken to seal or manage mine openings will comply with R645-301-529.100. At the time that the mine closure plan is submitted to the MMS, a copy will be forwarded to the Division for concurrence and approval and for addition to the mine plan on file. A copy will also be placed at the Emery Count Recorder's office. A formal plan will be submitted to the USGS for approval prior to final sealing of any openings. As per their on site inspection and plan approval, the openings will be sealed.

All surface equipment, as well as structures, including all concrete foundations, will be removed by the applicant after the

permanent cessation of operations.

#### **MW-1 Supply Well Abandonment**

Upon permanent cessation of mining operations, the water supply well, MW-1, will be permanently abandoned in accordance with regulations promulgated by the Utah Division of Water Rights. This will include filling of the well with a neat cement grout in accordance with the regulations.

#### **Temporary Cessation**

If operations are to be temporarily suspended for 30 days or longer, the applicant will submit a notice of intention to the Division. This notice will include a description of the extent and nature of existing surface and underground disturbance prior to temporary cessation. The statement will also cover the type of reclamation which will have been accomplished to date and also include the type of ongoing monitoring, number of opening closures, water treatment activities and other topographic rehabilitative efforts which have been or will be undertaken during this period. The applicant will maintain and secure the surface facilities and mine openings.

Applicant will implement the temporary cessation regulations as follows:

(a) Each person who conducts underground coal mining activities shall effectively support and maintain all surface access openings to underground operations, and secure surface facilities in areas in which there are no current operations, but operations are to be resumed under an approved permit. Temporary abandonment shall not relieve a person of his or her obligation to comply with any provisions of the approved permit.

(b) Before temporary cessation of mining and reclamation operations for a period of thirty days or more, or as soon as it is down that a temporary cessation will extend beyond thirty days, each person who conducts underground mining activities shall submit to the Division a notice of intention to cease or abandon operations. This notice shall include a statement of the exact number of surface acres and the horizontal and vertical extent of subsurface strata which have been in the permit area prior to cessation or abandonment, the extent and kind of reclamation of surface area which will have been accomplished, and identification of the backfilling, regrading, revegetation, environmental monitoring, underground opening closures, and water treatment activities that will continue during the temporary cessation.

(c) Each mine entry which is temporarily inactive but has a further projected useful service under the approved permit application, shall be protected by barricades or other covering

devices, fenced and posted with signs to prevent access into the entry and to identify the hazardous nature of the opening. These devices shall be periodically inspected and maintained in good operating condition by the person who conducts the underground coal mining activities.

(d) Each exploration hole, other drill hole, bore hole, shaft, well or other exposed underground opening which has been identified in the approved permit application for use to return underground workings, or to be used to monitor ground water conditions, shall be temporarily sealed until required for actual use.

#### 5.42 Narratives, Maps, and Plans

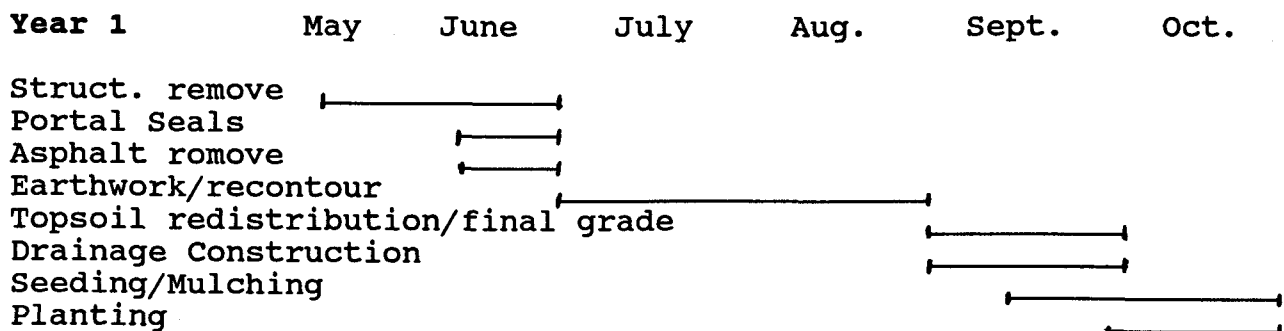
##### 5.42.10 Timetable

All reclamation, other than areas handled in contemporaneous reclamation, will commence with final grading of disturbed surface areas, which should be completed in approximately one month. Within 30 days following completion of final grading (which should be in August), topsoil from the stockpile will be redistributed. Nutrients and soil amendments, if shown to be required by soil tests, shall be applied to the redistributed topsoil before the end of October. Seeding, transplanting and mulching will then proceed when moisture conditions are optimal for planting and seeding. Seeding will commence as soon as the seedbed is finished in the late fall. Tree planting will be done in conjunction with seeding or in the following spring, as soon as one can work the soil.

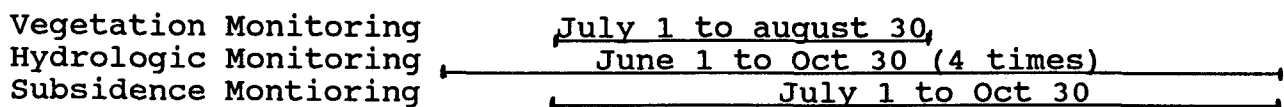
#### Timetable-Reclamation Activities: First available season following abandonment (cessation of mining)

Normal Access- May 15, begin demolition  
Structure removal- May 15 to June 30  
Seal portals- June 1 to June 30  
Asphalt Removal- June 15 to June 30  
Earthwork/recontouring- July 1 to August 30  
Topsoil redistribution- August 30 to Sept. 30  
Drainage Construction- Sept 1 to Sept 30  
Hydroseeding- Sept 15 to Oct 30  
Seeding/Planting- Oct 1 to Oct 30

## Final Abandonment- (cessation of mining)



## Year 2 through 10



## 5.42.20 through 5.42.32 Final Surface Configuration

All areas affected by surface operations will be graded and restored to a contour that is compatible with natural surroundings. All final grading will be done along the contour to minimize erosion and instability unless this operation becomes hazardous to the equipment operators. Backfilling and grading will proceed so as to eliminate or reduce the highwall. Refer to Plates 5-16, 5-17, and 5-17A.

A reclamation map showing post construction contemporaneous reclamation area, Plate 7-5, and final reclamation, Plates 5-16, 5-17, and 5-17A, accompanies this document. Slope rounding on Plate 5-3 has been revised to meet the required slope of 1.5:1 at the specified reclaimed cross sections.

### Contemporaneous Reclamation

All surface areas disturbed during our construction and which are not needed for mining operations were revegetated in the fall of the year following completion of the construction. This revegetation was performed as described in Chapter 3 of this document.

Disturbed areas within the mine plan area that contribute water directly to the sediment pond have been contemporaneously reclaimed. The goal of this reclamation was to achieve vegetative cover that will minimize erosion thus reducing the amount of soil material entering the sediment pond. To achieve this goal, a standard of 80% vegetative cover was met. Ocular estimates of cover are made each fall (early September) to determine if supplemental seeding is warranted.

A reclamation map showing post construction contemporaneous reclamation areas and final reclamation accompanies this chapter as Plate 5-17. The correct number of acres to be revegetated in final reclamation is 6.65 acres (additional; 1.1 acres is a road).

#### **5.42.40 Bond release**

Before seeking bond release, Genwal will provide a description of all temporary structures to be removed and reclaimed, and all permanent sedimentation ponds, impoundments, and treatment facilities that meet the requirements of the R645 rules for permanent structures, have been maintained properly and meet the requirements of the approved reclamation plan for permanent structures and impoundments.

#### **5.42.5 Timetable and Plans, Removal of Sedimentation Pond**

The only structures to remain after the mining operation will be the sedimentation system and all necessary diversions required to insure routing of all disturbed area drainage to the pond and diversions to maintain the integrity of the pond until requirements of R645-301-763.100 have been met. These diversions can be found on Plate 5-16 and 7-5.

Upon final cessation of mining the area will be reclaimed. Upon completion of the reclamation earthwork the sediment pond will be cleaned out and the material disposed of in the approved method. Once it is determined that the pond is no longer required for sediment control of the reclaimed area, the pond will be cleaned out again. The material in the pond should only be topsoil that has eroded from the reclaimed site (care will be taken not to mix the pond liner with this topsoil). This topsoil will be stockpiled allowed to dry. Once the topsoil has been dried the sediment pond will be eliminated and regraded to remove any capability to impound water. Topsoil will be redistributed over the reclaimed sediment pond site and the area reseeded.

Removal of the sediment pond was included during final reclamation to comply with the direct request of the Price Office of the U.S. Forest Service.

#### **5.42.60 Roads**

The Forest Service Development Road from Huntington Creek to the Forest Service turn around will remain as part of the post mining land use in accordance with the Forest Service permit shown in Appendix 1-2. See Plates 5-16, 5-17, and 5-17A for further details.

All other roads used for the operation of the Crandall Canyon Mine, within the permit boundaries, will be reclaimed in accordance with R645-301-542.610 through R645-301-542.640.

#### **5.42.70 Final Abandonment of Mine Openings and Disposal Areas**

#### **5.42.71 Closure and Management of Mine Openings**

When no longer needed for mining operations, all entry ways or other openings to the surface from the underground mine will be sealed and backfilled. Prior to the sealing of the mine openings, all combustible material will be removed from the underground bathhouse. All structure that will interfere with sealing of the mine openings will also be removed. The permanent closures will be constructed to prevent access to the mine workings by people, livestock, and wildlife. Potential surface drainage will also be kept from entering the sealed entries.

The bathhouse and other noncombustible underground structures will be left underground, and will meet the requirements of Title 30 CFR, Section 75. All combustible material will be removed from underground and hauled to an approved Sanitary Land Fill.

The portals will be backfilled with soil and two rows of solid concrete blocks placed across each entry and then backfilled to the surface and recontoured as shown on Plate 5-17. The block stoppings will be placed as far from the surface as is necessary to obtain a competent top and bottom.

A drain will be placed in the western most portal. This drain will be 18" deep and 10' wide and extend under the backfill to the highwall. This drain will be redesigned if the mine produces greater quantities of water than anticipated.

The formal sealing methods will be presented as a plan including cross sections demonstrating the measures taken to seal or manage mine openings will comply with R645-301-529.100.

#### **5.42.72 through 5.42.742 Excess Waste**

All waste material generated from the removal of the structures will be removed from the property and sold as scrap or disposed of in the Neilson Construction Land File, Ut. State permit No. 92-02.

See section 5.28 of this chapter for more detail on excess waste and spoil.

#### 5.42.80 Estimate of Reclamation Costs

Estimate of reclamation costs are included under Appendix 5-20, a bond estimate done by EarthFax. Final costs for reclamation, taken from Appendix 5-20, is as follows:

STRUCTURE REMOVAL	\$ 139,130.00
CUT AND FILL	\$ 75,480.00
DRAINAGE CONTROLS	\$ 40,500.00
TOPSOIL DISTRIBUTION	\$ 24,750.00
REVEGETATION	\$ 10,710.00
MONITORING	\$ 112,500.00
 SUBTOTAL	 \$ 403,070.00
OVERHEAD (10%)	\$ 40,300.00
 SUBTOTAL	 \$ 443,370.00
PROFIT	\$ 44,340.00
 SUBTOTAL	 \$ 487,710.00
BOND (1.5%)	\$ 7,290.00
 TOTAL	 \$ 495,000.00

#### 5.53 Backfilling and Grading

Backfilling and regrading of disturbed lands has been committed to in order to restore all areas affected by surface operations as near as possible to the contour of the land prior to disturbance. Reclamation of affected areas, including revegetation is outlined in Chapter 3 Section 3.41. All openings will be sealed as per the request of the MMS letter dated September 24, 1981, from Jackson Moffitt.

All areas affected by surface operations will be graded and restored to a contour that is compatible with natural surroundings and post mining land use as near as possible to the contour of the land prior to disturbance by our mining operations. Material will be laid down in 12" to 18" lifts and compacted through repeated travel by heavy equipment. This method has been utilized by a number of mines in the area and appears to give excellent compaction prior to topsoiling. In areas with slopes of less than 30%, the subsoil will be ripped to a depth of 18" then disced prior to topsoil placement. In areas having average slopes of more than 30% the subsoil will be ripped to a depth of 18", where practical. Topsoil will then be redistributed in a manner that achieves an approximate, uniform stable thickness and other specifications stated in chapter 2, section 2.42 of this document.



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### **Removal or Reduction of Cut Slopes**

Prior to backfilling and grading of cut slopes above the portal road, above the portals, and above the coal loadout area, existing shotcrete, wire mesh, clips, and other related material will be removed and disposed of in an appropriate manner. All noncombustible material generated from the removal of shotcrete will be disposed of underground (within the mine) prior to the sealing of the portals. All other waste generated will be removed and disposed of in an appropriate Utah State permitted land fill, such as the Neilsen Construction Land Fill, permit #92-02.

Backfilling and grading will proceed so as to eliminate or reduce the cut slope. This can be done by recontouring as described above.

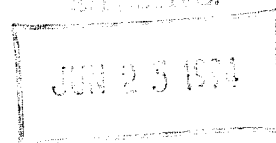
The cut slope above the coal stockpile area will be backfilled with as much material as is possible. The regrading and amount of material used is dictated by the location of the Forest Service Road, which will remain after final reclamation (see Appendix 1-2). See Plate 5-17 for the Forest Service road location.

### **Terracing and Erosion Control**

No terracing will be done. All final grading, preparation of overburden before replacement of topsoil will be done along the contour to minimize erosion and instability unless this operation becomes hazardous to equipment operators in which case the grading, preparation and placement in a direction other than generally parallel to the contour will be used.

### **Refuse Piles**

There are no refuse piles to reclaim at the Crandall Canyon mine site.



## Surface Coal Mining

There will be no surface coal mining activities at the Crandall Canyon Mine.

### 5.60 Performance Standards

All mining and reclamation operations at the Crandall Canyon Mine will be conducted in accordance with the R645 rules and this permit.

